Realising potential

GCSE DESIGN AND TECHNOLOGY

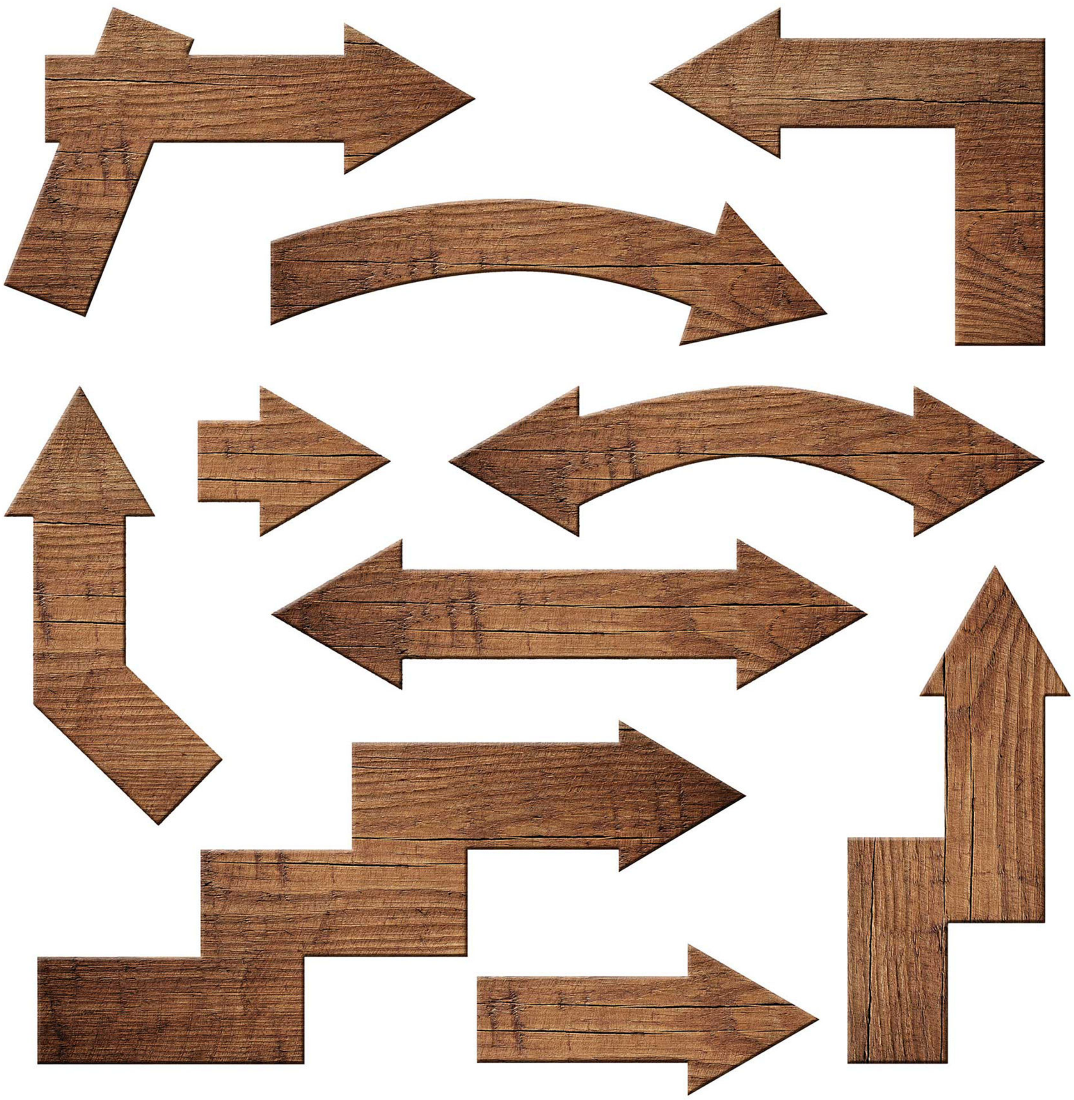
(8552)

Specification

For teaching from September 2017 onwards

For GCSE exams in 2019 onwards

Version 1.2 6 June 2022



Contents

Are you using the latest version of this specification?

- You will always find the most up-to-date version of this specification on our website at
- We will write to you if there are significant changes to the specification.

1 Introduction

1.1 Why choose AQA for GCSE Design and Technology

GCSE Design and Technology will prepare students to participate confidently and successfully in an increasingly technological world. Students will gain awareness and learn from wider influences on Design and Technology including historical, social, cultural, environmental and economic factors. Students will get the opportunity to work creatively when designing and making and apply technical and practical expertise.

Our GCSE allows students to study core technical and designing and making principles, including a broad range of design processes, materials techniques and equipment. They will also have the opportunity to study specialist technical principles in greater depth.

You can find out about all our Design and Technology qualifications at aqa.org.uk/designandtechnology

1.2 Support and resources to help you teach

We've worked with experienced teachers to provide you with a range of resources that will help you confidently plan, teach and prepare for exams.

1.2.1 Teaching resources

Visit aqa.org.uk/8552 to see all our teaching resources. They include:

- teaching guidance including lesson plans, and suggested teaching strategies to provide you with practical guidance to help deliver this specification
- non-exam assessment example materials and a dedicated subject adviser for every school or college to help you understand our expectations for this part of the assessment
- sample schemes of work to help you plan your course with confidence
- textbooks tailored to our specification and approved by AQA
- training courses to help you deliver AQA Design and Technology qualifications
- subject expertise courses for all teachers, from newly qualified teachers who are just getting started to experienced teachers looking for fresh inspiration.

1.2.2 Preparing for exams

Visit aqa.org.uk/8552 for everything you need to prepare for our exams, including:

- sample papers and mark schemes for new courses
- Exampro: a searchable bank of past AQA exam questions
- example student answers with examiner commentaries.

Analyse your students' results with Enhanced Results Analysis (ERA)

Find out which questions were the most challenging, how the results compare to previous years and where your students need to improve. ERA, our free online results analysis tool, will help you see where to focus your teaching. Register at aqa.org.uk/era

For information about results, including maintaining standards over time, grade boundaries and our post-results services, visit aqa.org.uk/results

Keep your skills up-to-date with professional development

Wherever you are in your career, there's always something new to learn. As well as subject specific training, we offer a range of courses to help boost your skills.

- Improve your teaching skills in areas including differentiation, teaching literacy and meeting Ofsted requirements.
- Prepare for a new role with our leadership and management courses.

You can attend a course at venues around the country, in your school or online – whatever suits your needs and availability. Find out more at coursesandevents.aqa.org.uk

Help and support

Visit our website for information, guidance, support and resources at aqa.org.uk/8552

If you'd like us to share news and information about this qualification, sign up for emails and updates at aqa.org.uk/keepinformed-computer-science

Alternatively, you can call or email our subject team direct.

E: dandt@aqa.org.uk

T: 0161 957 3334

2 Specification at a glance

This qualification is linear. Linear means that students will sit all their exams and submit all their non-exam assessment at the end of the course.

2.1 Subject content

2.2 Assessments

Paper 1
What's assessed • Core technical principles • Specialist technical principles • Designing and making principles In addition: • at least 15% of the exam will assess maths • at least 10% of the exam will assess science.
How it's assessed • Written exam: 2 hours • 100 marks • 50% of GCSE
Questions **Section A – Core technical principles (20 marks)** A mixture of multiple choice and short answer questions assessing a breadth of technical knowledge and understanding. **Section B – Specialist technical principles (30 marks)** Several short answer questions (2–5 marks) and one extended response to assess a more in depth knowledge of technical principles. **Section C – Designing and making principles (50 marks)** A mixture of short answer and extended response questions.

Non-exam assessment (NEA)

What's assessed

Practical application of:

- Core technical principles
- Specialist technical principles
- Designing and making principles

How it's assessed

- Non-exam assessment (NEA): 30–35 hours approx
- 100 marks
- 50% of GCSE

Task(s)

- Substantial design and make task
- Assessment criteria:
  - 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

3 Subject content

Our GCSE Design and Technology specification sets out the knowledge, understanding and skills required to undertake the iterative design process of exploring, creating and evaluating. The majority of the specification should be delivered through the practical application of this knowledge and understanding.

Topics and themes have been grouped to help you teach the specification, but these are not intended as a route through the specification – you can teach the content in any order. The subject content has been split into three sections as follows:

- Core technical principles
- Specialist technical principles
- Designing and making principles

Core technical principles (page 9) covers core technical principles and all content must be taught. Specialist technical principles (page 19) covers specialist technical principles where students will go into greater depth. Each principle should be taught through at least **one** material catergory or system. Designing and making principles (page 28) covers design and making principles and all content in this section must be taught.

The specification content is presented in a two column format. The left hand column contains the specification content all students must cover, and forms the basis for the assessments. This column sets out what students must know and understand to ensure they study the topic in appropriate depth and gives teachers the parameters in which the subject will be assessed.

Students must also demonstrate mathematical and scientific knowledge and understanding, in relation to design and technology. At least 15% of the exam will assess maths and at least 10% will assess science. The right hand column throughout this section illustrates where maths and science skills and knowledge can be applied to the wider design and technology content – but these are only examples and are not intended to be exhaustive.

The maths and science skills and knowledge as required by the DfE, are set out in Appendix: Links to maths and science (page 57) of this document.

3.1 Core technical principles

In order to make effective design choices students will need a breadth of core technical knowledge and understanding that consists of:

- new and emerging technologies
- energy generation and storage
- developments in new materials
- systems approach to designing
- mechanical devices
- materials and their working properties.

All of this section must be taught and all will be assessed.

3.1.1 New and emerging technologies

Students must know and understand the impact of new and emerging technologies on contemporary and potential future scenarios in relation to the following areas:

Industry

Content	Potential links to maths and science
The impact of new and emerging technologies on: • the design and organisation of the workplace including automation and the use of robotics • buildings and the place of work • tools and equipment.	

Enterprise

Content	Potential links to maths and science
Enterprise based on the development of an effective business innovation: • crowd funding • virtual marketing and retail • co-operatives • fair trade.	

Sustainability

Content	Potential links to maths and science
The impact of resource consumption on the planet: • finite • non-finite • disposal of waste.	Taking into consideration the ecological and social footprint of materials.

People

Content	Potential links to maths and science
How technology push/market pull affects choice. Changing job roles due to the emergence of new ways of working driven by technological change.	

Culture

Content	Potential links to maths and science
Changes in fashion and trends in relation to new and emergent technologies. Respecting people of different faiths and beliefs.	

Society

Content	Potential links to maths and science
How products are designed and made to avoid having a negative impact on others: • design for disabled • elderly • different religious groups.	

Environment

Content	Potential links to maths and science
Positive and negative impacts new products have on the environment: • continuous improvement • efficient working • pollution • global warming.	

Production techniques and systems

Content	Potential links to maths and science
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.	

How the critical evaluation of new and emerging technologies informs design decisions

Content	Potential links to maths and science
That it is important to consider scenarios from different perspectives and considering: • planned obsolescence • design for maintenance • ethics • the environment.	Ethical factors and consideration of ecological and social footprint.

3.1.2 Energy generation and storage

Students should understand how energy is generated and stored and how this is used as the basis for the selection of products and power systems.

Fossil fuels

Content	Potential links to maths and science
How power is generated from: • coal • gas • oil. Arguments for and against the selection of fossil fuels.	How to choose appropriate energy sources.

Nuclear power

Content	Potential links to maths and science
How nuclear power is generated. Arguments for and against the selection of nuclear power.	How to choose appropriate energy sources.

Renewable energy

Content	Potential links to maths and science
How power is generated from: • wind • solar • tidal • hydro-electrical • biomass. Arguments for and against the selection of renewable energy.	How to choose appropriate energy sources.

Energy storage systems including batteries

Content	Potential links to maths and science
Kinetic pumped storage systems. Alkaline and re-chargeable batteries.	How to choose appropriate energy sources.

3.1.3 Developments in new materials

Students should be aware of developments in new materials.

Modern materials

Content	Potential links to maths and science
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.	Classification of the types of properties of a range of materials. Selecting appropriate materials. Extracting information from technical specifications.

Smart materials

Content	Potential links to maths and science
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	Classification of the types of properties of a range of materials. Selecting appropriate materials. Extracting information from technical specifications.

Composite materials

Content	Potential links to maths and science
That composite materials are produced by combining two or more different materials to create an enhanced material eg glass reinforced plastic (GRP) and carbonfibre reinforced plastic (CRP).	Classification of the types of properties of a range of materials. Selecting appropriate materials. Extracting information from technical specifications.

Technical textiles

Content	Potential links to maths and science
How fibres can be spun to make enhanced fabrics eg conductive fabrics, fire resistant fabrics, kevlar and microfibres incorporating micro encapsulation.	Classification of the types of properties of a range of materials. Selecting appropriate materials. Extracting information from technical specifications.

3.1.4 Systems approach to designing

Students should consider electronic systems including programmable components to provide functionality to products and processes, and enhance and customise their operation.

Inputs

Content	Potential links to maths and science
The use of light sensors, temperature sensors, pressure sensors and switches.	Extracting information from technical specifications. Component names, interaction and operation.

Processes

Content	Potential links to maths and science
The use of programming microcontrollers as counters, timers and for decision making, to provide functionality to products and processes.	Extracting information from technical specifications. Component names, interaction and operation.

Outputs

Content	Potential links to maths and science
The use of buzzers, speakers and lamps, to provide functionality to products and processes.	Extracting information from technical specifications. Component names, interaction and operation.

3.1.5 Mechanical devices

Different types of movement

Content	Potential links to maths and science
The functions of mechanical devices to produce linear, rotary, reciprocating and oscillating movements.	Visualise and represent 2D and 3D objects including 2D diagrams of mechanisms/ mechanical movement.

Changing magnitude and direction of force

Content	Potential links to maths and science
Levers: • first order • second order • third order. Linkages: • bell cranks • push/pull. Rotary systems: • CAMs and followers • simple gear trains • pulleys and belts.	The action of forces and how levers and gears transmit and transform the effects of forces. Arithmetic and numerical computation eg use ratios. Use angular measures in degrees, visualise and represent 2D and 3D objects including 2D diagrams of mechanisms/ mechanical movement. Knowledge of the function of mechanical devices to produce different sorts of movement, changing the magnitude and direction of forces.

3.1.6 Materials and their working properties

Students should know and understand the categorisation of the types and properties of the following materials.

3.1.6.1 Material categories

Papers and boards

Content	Potential links to maths and science
Students should have an overview of the main categories and types of papers and boards: 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.	Classification of the types and properties of a range of materials. Physical properties of materials related to use and knowledge applied when designing and making.

Natural and manufactured timbers

Content	Potential links to maths and science
Students 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.	Classification of the types and properties of a range of materials. Physical properties of materials related to use and knowledge applied when designing and making.

Metals and alloys

Content	Potential links to maths and science
Students 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.	Classification of the types and properties of a range of materials. Physical properties of materials related to use and knowledge applied when designing and making.

Polymers

Content	Potential links to maths and science
Students 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).	Classification of the types and properties of a range of materials. Physical properties of materials related to use and knowledge applied when designing and making.

Textiles

Content	Potential links to maths and science
Students 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.	Classification of the types and properties of a range of materials. Physical properties of materials related to use and knowledge applied when designing and making.

3.1.6.2 Material properties

Students should have an understanding of the working and physical properties of the materials in Material categories (page 16).

Material properties

Content	Potential links to maths and science
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.	Scientific vocabulary eg metals/non-metals and physical and chemical differences between them eg types and properties across a range of materials. Using materials eg composition of some important alloys eg selection of an alloy for enhanced durability in a particular design situation.

3.2 Specialist technical principles

In addition to the core technical principles, all students should develop an in-depth knowledge and understanding of the following specialist technical principles:

- selection of materials or components
- forces and stresses
- ecological and social footprint
- sources and origins
- using and working with materials
- stock forms, types and sizes
- scales of production
- specialist techniques and processes
- surface treatments and finishes.

Each specialist technical principle should be delivered through **at least one** material category **or** system. Not all of the principles outlined above relate to every material category or system, but all must be taught.

The categories through which the principles can be delivered are:

- papers and boards
- timber based materials
- metal based materials
- polymers
- textile based materials
- electronic and mechanical systems.

3.2.1 Selection of materials or components

In relation to **at least one** material category or system, students should be able to select materials and components considering the factors listed below.

Content	Potential links to maths and science
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.	Calculation of material costs. Selection and use of materials considering end of life disposal.

3.2.2 Forces and stresses

In relation to **at least one** material category or system, students should know and understand the impact of forces and stresses and the way in which materials can be reinforced and stiffened.

Materials and objects can be manipulated to resist and work with forces and stresses

Content	Potential links to maths and science
Tension, compression, bending, torsion and shear.	Changing the magnitude and direction of forces.

Materials can be enhanced to resist and work with forces and stresses to improve functionality

Content	Potential links to maths and science
How materials can be reinforced, stiffened or made more flexible: eg lamination, bending, folding, webbing, fabric interfacing.	

3.2.3 Ecological and social footprint

In relation to **at least one** material category or system, students should have a knowledge and understanding of the ecological and social footprint left by designers.

Ecological issues in the design and manufacture of products

Content	Potential links to maths and science
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.	Selecting appropriate materials. Understanding of how to choose appropriate energy sources.

The six Rs

Content	Potential links to maths and science
Reduce, refuse, re-use, repair, recycle and rethink.	

Social issues in the design and manufacture of products

Content	Potential links to maths and science
Safe working conditions; reducing oceanic/ atmospheric pollution and reducing the detrimental (negative) impact on others.	Ethical factors and the social footprint of materials used in products.

3.2.4 Sources and origins

In relation to **at least one** material category, students should know and understand the sources and origins of materials.

Content	Potential links to maths and science
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).	Life cycle assessment and recycling ie the basic principles in carrying out a life cycle assessment of a material.

3.2.5 Using and working with materials

In relation to **at least one** material category or system, students should know and understand in addition to material properties, the factors listed below.

Properties of materials

Content	Potential links to maths and science
Students must know and understand how different properties of materials and components are used in commercial products, how properties influence use and how properties affect performance. Students must know and understand the physical and mechanical properties relevant to commercial products in their chosen area as follows. • Papers and boards (flyers/leaflets and card based food packaging). • Timber based materials (traditional timber children's toys and flat pack furniture). • Metal based materials (cooking utensils and hand tools). • Polymers (polymer seating and electrical fittings). • Textile based materials (sportswear and furnishings). • Electronic and mechanical systems (motor vehicles and domestic appliances).	How physical and working properties are selected related and used in commercial products when designing and making.

The modification of properties for specific purposes

Content	Potential links to maths and science
• Additives to prevent moisture transfer (paper and boards). • Seasoning to reduce moisture content of timbers (timber based materials). • Annealing to soften material to improve malleability (metal based materials). • Stabilisers to resist UV degradation (polymers). • Flame retardants reduce combustion and fire hazards (textile based materials). • Photosensitive PCB board in PCB manufacture and anodizing aluminium to improve surface hardness (electronic and mechanical systems).	

How to shape and form using cutting, abrasion and addition

Content	Potential links to maths and science
• Papers and boards (how to cut, crease, score, fold and perforate card). • Timber based materials (how to cut, drill, chisel, sand and plane). • Metal based materials (how to cut, drill, turn, mill, cast, braze and weld). • Polymers (how to cut, drill, cast, deform, print and weld). • Textile based materials (how to sew, pleat, gather, quilt and pipe). • Electronic and mechanical systems (how to cut, drill and solder).	

3.2.6 Stock forms, types and sizes

In relation to **at least one** material category or system, students should know and understand the different stock forms types and sizes in order to calculate and determine the quantity of materials or components required.

Content	Potential links to maths and science
Commercially available types and sizes of materials and components. 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. Timber based materials: • planks, boards and standard moldings • sold by length, width, thickness and diameter • standard components eg woodscrews, hinges, KD fittings. 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).	Calculation of material quantities and sizes. Calculate surface area and volume eg material requirements for a specific use. Efficient material use, pattern spacing, nesting and minimising waste.

3.2.7 Scales of production

In relation to **at least one** material category or system, students should be able to select materials and components considering scales of production and referencing the processes listed in Specialist Techniques and processes. (page 25)

Content	Potential links to maths and science
How products are produced in different volumes. The reasons why different manufacturing methods are used for different production volumes: • prototype • batch • mass • continuous.	

3.2.8 Specialist techniques and processes

In relation to **at least one** material category or system, students should know and understand the factors listed below.

The use of production aids

Content	Potential links to maths and science
How to use measurement/reference points, templates, jigs and patterns where suitable.	Scaling of drawings, working to datums. Material quantities required.

Tools, equipment and processes

Content	Potential links to maths and science
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.	

How materials are cut shaped and formed to a tolerance

Content	Potential links to maths and science
The manufacture to minimum and maximum measurements.	Extracting information on tolerances and using it to control quality and make a prototype.

Commercial processes

Content	Potential links to maths and science
• 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).	

Quality control

Content	Potential links to maths and science
The application and use of quality control to include measurable and quantitative systems used during manufacture • 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).	

3.2.9 Surface treatments and finishes

In relation to **at least one** material category or system, students should have knowledge and understanding of surface treatments and finishes.

Content	Potential links to maths and science
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).	Surface treatments to inhibit corrosion and oxidation.

3.3 Designing and making principles

Students should know and understand that all design and technology activities take place within a wide range of contexts.

They should also understand how the prototypes they develop must satisfy wants or needs and be fit for their intended use. For example, the home, school, work or leisure.

They will need to demonstrate and apply knowledge and understanding of designing and making principles in relation to the following areas:

- investigation, primary and secondary data
- environmental, social and economic challenge
- the work of others
- design strategies
- communication of design ideas
- prototype development
- selection of materials and components
- tolerances
- material management
- specialist tools and equipment
- specialist techniques and processes.

3.3.1 Investigation, primary and secondary data

Use primary and secondary data to understand client and/or user needs

Content	Potential links to maths and science
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.	Analysing responses to user questionnaires. Frequency tables and information on design decisions. Presentation of client survey responses. Percentiles ranges used in anthropometrics and/or ergonomics.

How to write a design brief and produce a design and manufacturing specification

Content	Potential links to maths and science
Students should consider their own needs, wants and interests and those of others.	

Carry out investigations in order to identfy problems and needs

Content	Potential links to maths and science
Why a designer considers alterations to a brief and modifying the brief as required.	Comparative chart of performance criteria as for existing products to help evaluate them.

3.3.2 Environmental, social and economic challenge

Content	Potential links to maths and science
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.	Selection of materials based on ethical factors and social and environmental footprints.

3.3.3 The work of others

Content	Potential links to maths and science
Students should investigate, analyse and evaluate the work of past and present designers and companies to inform their own designing. Students should investigate the work of a minimum of two of the following designers: • Alexander McQueen • Aldo Rossi • Aljoud Lootah • Charles Rennie Macintosh • Coco Chanel • David Adjaye • Elsie Owusu • Ettore Sottsass • Gerrit Reitveld • Harry Beck • Joe Casely-Hayford • Karim Rashid • Kusheda Mensah • Louis Comfort Tiffany • Marcel Breuer • Mary Quant • Morag Myerscough • Norman Foster • Philippe Starck • Pierre Davis • Raymond Templier • Rei Kawakubo • Sir Alec Issigonis • The Singh Twins • Vivienne Westwood • William Morris • Yinka Ilori • Zaha Hadid. Students should investigate the work of a minimum of two of the following companies: • Alessi • Apple • Braun • Dyson • Gap • Primark • Under Armour • Zara.	

3.3.4 Design strategies

Generate imaginative and creative design ideas using a range of different design strategies

Content	Potential links to maths and science
How different strategies can be applied, including: • collaboration • user centered design • a systems approach • iterative design • avoiding design fixation.	

Explore and develop their own ideas

Content	Potential links to maths and science
How this can be done using an iterative process including: • sketching • modelling • testing • evaluation of their work to improve outcomes.	Measurement and marking out of component parts for models.

3.3.5 Communication of design ideas

Content	Potential links to maths and science
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.	Scaling drawings.

3.3.6 Prototype development

Content	Potential links to maths and science
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.	A presentation of data; tabulate responses and findings.

In relation to at least one of the following material categories students must develop and apply an in-depth knowledge and understanding of sections Selection of materials and components (page 33) to Specialist techniques and processes (page 35)

- papers and boards
- timber based materials
- metal based materials
- polymers
- textile based materials
- electronic and mechanical systems.

3.3.7 Selection of materials and components

Content	Potential links to maths and science
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.	SI units; identify appropriate commercially available stock forms and select appropriately. Composition of some important alloys; selecting appropriate metal alloys as required.

3.3.8 Tolerances

Content	Potential links to maths and science
Work accurately using tolerances. How a range of materials are cut, shaped and formed to designated tolerances. Why tolerances are applied during making activities.	SI units eg accurate use of appropriate tolerances +/- 2mm, resistor tolerance and seam allowance.

3.3.9 Material management

Cut materials efficiently and minimise waste

Content	Potential links to maths and science
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.	Expression in decimal and standard form eg calculation of required materials. Calculate surface area and volume eg material requirements. Angular measures eg measurement and marking out. SI units eg measurement of materials and components using standard units as appropriate. The use of reference datum points and co-ordinates.

Use appropriate marking out methods, data points and coordinates

Content	Potential links to maths and science
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	Use angular measures eg tessellation of component parts. Calculating material area eg working out the quantity of materials required. SI units eg accurate use of appropriate units of measurement to calculate material requirements.

3.3.10 Specialist tools and equipment

Content	Potential links to maths and science
How to select and use specialist tools and equipment, including hand tools, machinery, digital design and manufacture, appropriate for the material and/or task to complete quality outcomes. How to use them safely to protect themselves and others from harm.	

3.3.11 Specialist techniques and processes

Content	Potential links to maths and science
How to select and use specialist techniques and processes appropriate for the material and/or task and use them to the required level of accuracy in order to complete quality outcomes. How to use them safely to shape, fabricate and construct a high quality prototype, including techniques such as wastage, addition, deforming and reforming.	

Surface treatments and finishes

Content	Potential links to maths and science
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.	Corrosion and oxidation eg how corrosion and/or oxidation affects different materials, how they can be protected through different surface treatments and finishes.

4 Scheme of assessment

Find past papers and mark schemes, and specimen papers for new courses, on our website at aqa.org.uk/pastpapers

This specification is designed to be taken over two years.

This is a linear qualification. In order to achieve the award, students must complete all assessments at the end of the course and in the same series.

GCSE exams and certification for this specification are available for the first time in May/June 2019 and then every May/June for the life of the specification.

All materials are available in English only.

Our GCSE exams in Design and Technology include questions that allow students to demonstrate their ability to:

- recall information
- draw together information from different areas of the specification
- apply their knowledge and understanding in practical and theoretical contexts.

4.1 Aims and learning outcomes

Courses based on this specification must encourage students to:

- demonstrate their understanding that all design and technological activity takes place within contexts that influence the outcomes of design practice
- develop realistic design proposals as a result of the exploration of design opportunities and users' needs, wants and values
- use imagination, experimentation and combine ideas when designing
- develop the skills to critique and refine their own ideas whilst designing and making
- communicate their design ideas and decisions using different media and techniques, as appropriate for different audiences at key points in their designing
- develop decision making skills, including the planning and organisation of time and resources when managing their own project work
- develop a broad knowledge of materials, components and technologies and practical skills to develop high quality, imaginative and functional prototypes
- be ambitious and open to explore and take design risks in order to stretch the development of design proposals, avoiding clichéd or stereotypical responses
- consider the costs, commercial viability and marketing of products
- demonstrate safe working practices in design and technology
- use key design and technology terminology including those related to: designing, innovation and communication; materials and technologies; making, manufacture and production; critiquing, values and ethics.

4.2 Assessment objectives

Assessment objectives (AOs) are set by Ofqual and are the same across all GCSE Design and Technology specifications and all exam boards.

The exams and non-exam assessment will measure how students have achieved the following assessment objectives.

- AO1: Identify, investigate and outline design possibilities to address needs and wants.
- AO2: Design and make prototypes that are fit for purpose.
- AO3: Analyse and evaluate:
  - design decisions and outcomes, including for prototypes made by themselves and others
  - wider issues in design and technology.
- AO4: Demonstrate and apply knowledge and understanding of:
  - technical principles
  - designing and making principles.

4.2.1 Assessment objective weightings for GCSE Design and Technology

Assessment objectives (AOs)	Component weightings (approx %)		Overall weighting (approx %)
	Paper 1	NEA	
AO1	0	10	10
AO2	0	30	30
AO3	10	10	20
AO4	40	0	40
Overall weighting of components	50	50	100

4.3 Assessment weightings

The marks awarded on the papers will be scaled to meet the weighting of the components. Students' final marks will be calculated by adding together the scaled marks for each component. Grade boundaries will be set using this total scaled mark. The scaling and total scaled marks are shown in the table below.

Component	Maximum raw mark	Scaling factor	Maximum scaled mark
Paper 1	100	x1	100
NEA	100	x1	100
		Total scaled mark:	200

4.4 Non-exam assessment

The Non-exam assessment will contribute towards 50% of the students overall mark. The NEA project in its entirety should take between 30–35 hours to complete and consist of a working prototype and a concise portfolio of approximately 20 pages of A3 paper, equivalent A4 paper or the digital equivalent.

Students' work should consist of an investigation into a contextual challenge, defining the needs and wants of the user and include relevant research to produce a design brief and specification. Students should generate design ideas with flair and creativity and develop these to create a final design solution (including modelling). A manufacturing specification should be produced to conclude your design findings leading into the realisation of a final prototype that is fit for purpose and a final evaluation. Students should investigate, analyse and evaluate throughout the portfolio and evidence all decisions made.

Six criteria are produced for assessment and there are a number of points within each. Each band should be viewed holistically when marking assessments. Students who produce no work for a criterion or work that is below a GCSE standard should be awarded zero.

The criteria should not be viewed as a linear process to be followed in a step by step manner. Rather, students should be encouraged to follow the iterative design process and assessors encouraged to award marks where they are deserved and can be evidenced. You should ensure that the criteria are assessed accurately and students are not rewarded for quantity of work but the quality of work produced.

With the assessment process being viewed holistically it's vital that students clearly record their work so it is clear where the marks can be awarded. It's also essential that teachers provide clear annotation to support their assessments.

4.4.1 Setting the task

Students will be required to undertake a small-scale design and make task and produce a final prototype based on a design brief produced by the student.

The contextual challenges for the task will be set by us and allow students to select from a list issued to schools via e-AQA. The contexts will change every year and will be released on 1 June in the year prior to the assessment being submitted.

4.4.2 Taking the task

With reference to the context, students will be expected to develop a specific brief that meets the needs of a user, client or market.

The task must be of an appropriate level of complexity and contain a degree of uncertainty of the outcome so that students can engage in an iterative process of designing, making, testing, improving and evaluating.

Students must produce a final prototype based on the design brief that they have developed, along with a written or digital design folder or portfolio.

4.4.2.1 Evidence

Students must produce a written or digital design folder clearly evidencing how the assessment criteria have been met, together with photographic evidence of the final manufactured prototype.

Students should produce a concise folder. We recommend that this folder does not exceed 20 pages of A3 paper, equivalent A4 paper or the digital equivalent.

Students who do not follow these guidelines will penalise themselves by not meeting the expectations of the assessment appropriately.

Students that exceed the recommended length will self-penalise by not being appropriately focused on the demands of the task. Students that produce work that is shorter than the recommended page count will self-penalise by not allowing appropriate coverage of the assessment objectives.

4.4.2.2 Time limits

Students should spend 30–35 hours on their NEA unless there are specific access requirements that should be considered.

We expect students to be selective in their choice of material to include, and to manage their time appropriately.

4.4.3 Feedback

Students are free to revise and redraft a piece of work before submitting the final piece for assessment. You can review draft work and provide **generic feedback** to ensure that the work is appropriately focused. In providing generic feedback you **can**:

- provide feedback in oral and/or written form
- explain syntax in general terms
- advise on resources that could be used
- remind students of the key sections that should be included in their final folder.

In providing generic feedback you **cannot**:

- correct a student's work
- provide templates, model answers or writing frames
- provide specific guidance
- provide specific feedback to students on how to improve their projects to meet the requirements of the marking criteria
- give examples of how to implement
- provide feedback where a student has produced an incomplete stage and this is sufficient to allow progression to the next stage.

A clear distinction must be drawn between providing feedback to students as part of work in progress and reviewing work once it has been submitted by the student for final assessment. Once work is submitted for final assessment it cannot be revised. It is not acceptable for you to give, either to individual students or to groups, feedback and suggestions as to how the work may be improved in order to meet the marking criteria.

In accordance with the JCQ Instructions for conducting NEA, any support or feedback given to individual students which has not been provided to the class as a whole must be clearly recorded on the CRF and the student's mark must be appropriately adjusted to represent the student's unaided achievement.

4.4.4 Assessment criteria

Guidance on applying the marking criteria

Level of response marking instructions are broken down into mark bands, each of which has a descriptor. The descriptor for the mark band shows the average performance for the level required. Before you apply the mark scheme to a student's project, review both the prototype and portfolio and annotate it and/or make notes on it to show the qualities that are being looked for. You can then apply the marking criteria.

Start at the lowest band of the marking criteria and use it as a ladder to see whether the work meets the descriptor for that band. The descriptor for the band indicates the different qualities that might be seen in the student's work for that level. If it meets descriptors for the lowest band then go to the next one and decide if it meets this, and so on, until you have a match between the band descriptor and the student's work.

You can compare your student's work with the standardisation examples to determine if it is the same standard, better or worse. When assigning a level you should look at the overall quality of the work. If the project covers different aspects of different levels of the mark scheme you should use a best fit approach for defining the level and then use the variability of the work to help decide the mark within the band.

To select the most appropriate mark in the band descriptor, teachers should use the following guidance to locate the best-fit:

- where the student's work fully meets all statements, the highest mark should be awarded
- where the student's work mostly meets all statements, the most appropriate mark in the middle of the range should be awarded
- where the learner's work just meets the majority of statements, the lowest mark should be awarded.

There will be instances where a student fully meets for example 3/4 statements but only just meets the other. In this scenario a best-fit approach should be taken. If, in this scenario, the range of marks within the band was 16–20, then a mark of 18/19 would be appropriate.

The assessment criteria for the NEA are split into six sections as follows.

	Section	Criteria	Maximun marks
AO1 Identify, investigate and outline design possibilities	A	Identifying & investigating design possibilities	10
	B	Producing a design brief & specification	10
A02 Design and make prototypes that are fit for purpose	C	Generating design ideas	20
	D	Developing design ideas	20
	E	Realising design ideas	20
A03 Analyse and evaluate	F	Analysing & evaluating	20
	Total		100

4.4.4.1 Section A: Identifying and investigating design possibilities (10 marks)

By analysing the contextual challenge students will identify design possibilities, investigate client needs and wants and factors including economic and social challenges. Students should also use the work of others (past and/or present) to help them form ideas. Research should be concise and relate to their contextual challenge. Students are also advised to use a range of research techniques (primary/secondary) in order to draw accurate conclusions. Students should be encouraged to investigate throughout their project to help inform decisions.

Mark band	Description
9–10	Design possibilities identified and thoroughly explored, directly linked to a contextual challenge demonstrating excellent understanding of the problems/opportunities. A user/client has been clearly identified and is entirely relevant in all aspects to the contextual challenge and student has undertaken a comprehensive investigation of their needs and wants, with a clear explanation and justification of all aspects of these. Comprehensive investigation into the work of others that clearly informs ideas. Excellent design focus and full understanding of the impact on society including; economic and social effects. Extensive evidence that investigation of design possibilities has taken place throughout the project with excellent justification and understanding of possibilities identified.
6–8	Design possibilities identified and explored, linked to a contextual challenge demonstrating a good understanding of the problems/opportunities. A user/client has been identified that is mostly relevant to the contextual challenge and student has undertaken an investigation of their needs and wants, with a good explanation and justification of most aspects of these. Detailed investigation into the work of others that has influenced ideas. Good design focus and understanding of the impact on society including; economic and social effects. Evidence of investigation of design possibilities at various stages in the project with good justification and understanding of possibilities identified.
3–5	Design possibilities identified and explored with some link to a contextual challenge demonstrating adequate understanding of the problems/ opportunities. A user/client has been identified that is partially relevant to the contextual challenge. Student has undertaken an investigation of their needs and wants, with some explanation and justification of some aspects of these. Some investigation into the work of others that has had some influence on their ideas. Some design focus and understanding of the impact on society including; economic and social effects. Investigation of design possibilities goes beyond the initial stages of the project but only some justification and understanding of possibilities identified.

Mark band	Description
1–2	Basic design possibilities identified. Link to a contextual challenge is unclear and student demonstrates only a limited understanding of the problems/ opportunities. An attempt has been made to identify a user/client but is not be relevant to the contextual challenge. Student has undertaken a basic investigation of their needs and wants, but given little explanation and justification of these. Basic investigation into the work of others that has not been used to inform their ideas. Limited design focus and understanding of the impact on society including; economic and social effects. Investigation of design possibilities only takes place in the initial stages of the project and there is very little justification and understanding of possibilities identified.
0	Nothing worthy of credit.

4.4.4.2 Section B: Producing a design brief and specification (10 marks)

Based on conclusions from their investigations students will outline design possibilities by producing a design brief and design specification. Students should review both throughout the project.

Mark band	Description
9–10	Comprehensive design brief which clearly justifies how they have considered their user/client's needs and wants and links directly to the context selected. Comprehensive design specification with very high level of justification linking to the needs and wants of the client/user. Fully informs subsequent design stages.
6–8	Good design brief with an attempt to justify how they have considered most of their client's needs and wants and has clear links to the context selected. Detailed design specification with good justification linking to the needs and wants of the client/user. Largely informs subsequent design stages.
3–5	Adequate design brief with some consideration of their client's needs and wants is evident, as is the relevance to the context selected. Adequate design specification lacking some detail. Some justification linking to the needs and wants of the client/user. Informs subsequent design stages to some extent.
1–2	Basic design brief that contains only limited consideration of their client's needs and wants and has little or no relevance to the context selected. Basic design specification has minimal detail. Limited justification linking to the needs and wants of the client/user. Very little influence on subsequent design stages.

Mark band	Description
0	Nothing worthy of credit.

4.4.4.3 Section C: Generating design ideas (20 marks)

Students should explore a range of possible ideas linking to the contextual challenge selected. These design ideas should demonstrate flair and originality and students are encouraged to take risks with their designs. Students may wish to use a variety of techniques to communicate.

Students will not be awarded for the quantity of design ideas but how well their ideas address the contextual challenge selected. Students are encouraged to be imaginative in their approach by experimenting with different ideas and possibilities that avoid design fixation.

In the highest band students are expected to show some innovation by generating ideas that are different to the work of the majority of their peers or demonstrate new ways of improving existing solutions.

Mark band	Description
16–20	Imaginative, creative and innovative ideas have been generated, fully avoiding design fixation and with full consideration of functionality, aesthetics and innovation. Ideas have been generated, that take full account of on-going investigation that is both fully relevant and focused. Extensive experimentation and excellent communication is evident, using a wide range of techniques. Imaginative use of different design strategies for different purposes and as part of a fully integrated approach to designing.
11–15	Imaginative and creative ideas have been generated which mainly avoid design fixation and have adequate consideration of functionality, aesthetics and innovation. Ideas have been generated, taking into account on-going investigation that is relevant and focused. Good experimentation and communication is evident, using a wide range of techniques. Effective use of different design strategies for different purposes as an approach to designing.
6–10	Imaginative ideas have been generated with a degree of design fixation and having some consideration of functionality, aesthetics and innovation. Ideas have been generated that take some account of investigations carried out but may lack relevance and/or focus. Experimentation is sufficient to generate a range of ideas. Communication is evident, using a range of techniques. Different design strategies explored but only at a superficial level with the approach tending to be fairly narrow.

Mark band	Description
1–5	Basic ideas have been generated with clear design fixation and limited consideration of functionality, aesthetics and innovation. Ideas generated taking little or no account of investigations carried out. Basic experimentation and communication is evident, using a limited number of techniques. Basic use of a single design strategy.
0	Nothing worthy of credit.

4.4.4.4 Section D: Developing design ideas (20 marks)

Students will develop and refine design ideas. This may include, formal and informal 2D/3D drawing including CAD, systems and schematic diagrams, models and schedules. Students will develop at least one model, however marks will be awarded for the suitability of the model(s) and not the quantity produced.

Students will also select suitable materials and components communicating their decisions throughout the development process. Students are encouraged to reflect on their developed ideas by looking at their requirements; including how their designs meet the design specification. Part of this work will then feed into the development of a manufacturing specification providing sufficient accurate information for third party manufacture, using a range of appropriate methods, such as measured drawings, control programs, circuit diagrams, patterns, cutting or parts lists.

Mark band	Description
16–20	Very detailed development work is evident, using a wide range of 2D/3D techniques (including CAD where appropriate) in order to develop a prototype. Excellent modelling, using a wide variety of methods to test their design ideas, fully meeting all requirements. Fully appropriate materials/components selected with extensive research into their working properties and availability. Fully detailed manufacturing specification is produced with comprehensive justification to inform manufacture.
11–15	Good development work is evident, using a range of 2D/3D techniques (including CAD where appropriate) in order to develop a prototype. Good modelling which uses a variety of methods to test their design ideas, largely meeting requirements. Materials/components selected are mostly appropriate with good research into their working properties and availability. Largely detailed manufacturing specification is produced with good justification to inform manufacture.

Mark band	Description
6–10	Development work is sufficient, using some 2D/3D techniques (including CAD where appropriate) in order to develop a prototype. Modelling is sufficient, using a variety of methods to test their design ideas, meeting some requirements. Materials/components selected with some research into their working properties and availability. Some of these may not be fully appropriate for purpose. Adequate manufacturing specification contains sufficient detail with some justification to inform manufacture.
1–5	Basic development work is evident, using a limited range of 2D/3D techniques (including CAD where appropriate) in order to develop a prototype. Modelling is basic, using a limited number of methods to test their design ideas meeting requirements only superficially. Materials/components selected with minimal research into their working properties or availability and may not be fully fit for purpose. Basic manufacturing specification that lacks detail and has minimal justification to inform manufacture.
0	Nothing worthy of credit.

4.4.4.5 Section E: Realising design ideas (20 marks)

Students will work with a range of appropriate materials/components to produce prototypes that are accurate and within close tolerances. This will involve using specialist tools and equipment, which may include hand tools, machines or CAM/CNC. The prototypes will be constructed through a range of techniques, which may involve shaping, fabrication, construction and assembly. The prototypes will have suitable finish with functional and aesthetic qualities, where appropriate. Students will be awarded marks for the quality of their prototype(s) and how it addresses the design brief and design specification based on a contextual challenge.

Mark band	Description
16–20	The correct tools, materials and equipment (including CAM where appropriate) have been consistently used or operated safely with an exceptionally high level of skill. A high level of quality control is evident to ensure the prototype is accurate by consistently applying very close tolerances. Prototype shows an exceptionally high level of making/finishing skills that are fully consistent and appropriate to the desired outcome. An exceptionally high quality prototype that has the potential to be commercially viable has been produced and fully meets the needs of the client/user.

Mark band	Description
11–15	The correct tools, materials and equipment (including CAM where appropriate) have been used or operated safely with a good level, of skill. Detailed quality control is evident to ensure the prototype is mostly accurate through partial application of tolerances. Prototype shows a good level of making/finishing skills that are largely consistent and appropriate to the desired outcome. A good quality prototype that may have potential to be commercially viable has been produced which mostly meets the needs of the client/user.
6–10	The correct tools, materials and equipment (including CAM where appropriate) have been used or operated safely with an adequate level of skill. Some quality control is evident through measurement and testing. Prototype shows an adequate level of making/finishing skills that are mostly appropriate to the desired outcome. A prototype of sufficient quality has been produced that may have potential to be commercially viable, although further developments would be required, and only partially meets the needs of the client/user.
1–5	Tools, materials and equipment (including CAM where appropriate) have been used or operated safely at a basic level. Basic quality control is evident through measurement only. Prototype shows a basic level of making/finishing skills which may not be appropriate for the desired outcome. A prototype of basic quality has been produced with little or no potential to be commercially viable and does not meet the needs of the client/user.
0	Nothing worthy of credit.

4.4.4.6 Section F: Analysing and evaluating (20 marks)

Within this iterative design process students are expected to continuously analyse and evaluate their work, using their decisions to improve outcomes. This should include defining requirements, analysing the design brief and specifications along with the testing and evaluating of ideas produced during the generation and development stages. Their final prototype(s) will also undergo a range of tests on which the final evaluation will be formulated. This should include market testing and a detailed analysis of the prototype(s).

Mark band	Description
16–20	Extensive evidence that various iterations are as a direct result of considerations linked to testing, analysis and evaluation of the prototype, including well considered feedback from third parties. Comprehensive testing of all aspects of the final prototype against the design brief and specification. Fully detailed and justified reference is made to any modifications both proposed and undertaken. Excellent ongoing analysis and evaluation evident throughout the project that clearly influences the design brief and the design and manufacturing specifications.
11–15	Good evidence that various iterations are as a result of considerations linked to testing, analysis and evaluation of the prototype, including some consideration of feedback from third parties. Good testing of most aspects of the final prototype against the design brief and specification. Detailed reference is made to any modifications either proposed or undertaken. Good analysis and evaluation at most stages of the project that influences the design brief and the design and manufacturing specifications.
6–10	Some evidence that various iterations are as a result of considerations linked to testing, analysis and evaluation of the prototype, including basic consideration of feedback from third parties. Adequate testing of some aspects of the final prototype against the design brief and specification. Some reference is made to modifications either proposed or undertaken. Adequate analysis and evaluation is present at some stages of the project but does not have sufficient influence on the design brief and the design and manufacturing specifications.
1–5	Limited evidence that various iterations are as a result of considerations linked to testing, analysis and evaluation of the prototype. Basic testing of some aspects of the final prototype against the design brief and specification. Little reference is made to any modifications either proposed or undertaken. Superficial analysis and evaluation. Little influence on the design brief and the design and manufacturing specifications.
0	Nothing worthy of credit.

5 Non-exam assessment administration

The non-exam assessment (NEA) for this specification is made up of a single design and make task.

Visit aqa.org.uk/8552 for detailed information about all aspects of NEA administration.

The head of the school or college is responsible for making sure that NEA is conducted in line with our instructions and Joint Council for Qualifications (JCQ) instructions.

5.1 Supervising and authenticating

To meet Ofqual's qualification and subject criteria:

- **students** must sign the *Candidate record form* (CRF) to confirm that the work submitted is their own
- all **teachers** who have marked a student's work must sign the declaration of authentication on the CRF (this is to confirm that the work is solely that of the student concerned and was conducted under the conditions laid down by this specification)
- teachers must ensure that a CRF is attached to each student's work.

All practical work that is submitted for assessment must be completed under direct supervision. If a student needs to undertake some work that cannot be completed in school/college no credit can be given for the work undertaken off site. You must ensure that you are familiar with the prototype before it is taken off site and also verify it after any off site work has been completed to ensure that the only work that has been completed off site is what has been discussed beforehand.

Students must have sufficient direct supervision for the written element to ensure that the work submitted can be confidently authenticated as their own. If a student receives additional assistance and this is acceptable within the guidelines for this specification, you should award a mark that represents the student's unaided achievement. Please make a note of the support the student received on the CRF and sign the authentication statement. If the statement is not signed, we cannot accept the student's work for assessment.

5.2 Avoiding malpractice

Please inform your students of the AQA regulations concerning malpractice. They must not:

- submit work that is not their own
- lend work to other students
- allow other students access to, or use of, their own independently sourced source material (they may lend their books to another student, but they must not plagiarise other students' research)
- include work copied directly from books, the internet or other sources without acknowledgement
- submit work that is word-processed by a third person without acknowledgement
- include inappropriate, offensive or obscene material.

These actions constitute malpractice and a penalty will be given (for example, disqualification).

If you identify malpractice **before** the student signs the declaration of authentication, you don't need to report it to us. Please deal with it in accordance with your school or college's internal procedures. We expect schools and colleges to treat such cases very seriously.

If you identify malpractice **after** the student has signed the declaration of authentication, the head of your school or college must submit full details of the case to us at the earliest opportunity. Please complete the form JCQ/M1, available from the JCQ website at jcq.org.uk

You must record details of any work which is not the student's own on the CRF or another appropriate place.

Consult your exams officer about these procedures.

5.3 Internal standardisation

You must ensure that you have consistent marking standards for all students. One person must manage this process and they must sign the Centre declaration sheet to confirm that internal standardisation has taken place.

Internal standardisation may involve:

- all teachers marking sample pieces of work to identify differences in marking standards
- discussing any differences in marking at a training meeting for all teachers involved
- referring to reference and archive material such as previous work or examples from our teacher standardisation.

5.4 Commenting

To meet Ofqual's qualification and subject criteria, you must show clearly how marks have been awarded against the marking criteria in this specification.

Your comments will help the moderator see, as precisely as possible, where you think the students have met the marking criteria.

You must record your comments on the CRF.

5.5 Submitting marks

You must check that the correct marks are written on the CRF and that the total is correct.

The deadline for submitting the total mark for each student is given at aqa.org.uk/keydates

5.6 Factors affecting individual students

For advice and guidance about arrangements for any of your students, please email us as early as possible at eos@aqa.org.uk

Occasional absence: you should be able to accept the occasional absence of students by making sure they have the chance to make up what they have missed. You may organise an alternative supervised session for students who were absent at the time you originally arranged.

Lost work: if work is lost you must tell us how and when it was lost and who was responsible, using our special consideration online service at aqa.org.uk/eaqa

Extra help: where students need extra help which goes beyond normal learning support, please use the CRF to tell us so that this help can be taken into account during moderation.

Students who move schools: students who move from one school or college to another during the course sometimes need additional help to meet the requirements. How you deal with this depends on when the move takes place.

- If it happens early in the course, the new school or college should be responsible for the work.
- If it happens late in the course, it may be possible to arrange for the moderator to assess the work as a student who was 'educated elsewhere'.

5.7 Keeping students' work

Students' work must be kept under secure conditions from the time that it is marked, with CRFs attached. After the moderation period and the deadline for Enquiries about Results (or once any enquiry is resolved) you may return the work to students.

5.8 Moderation

You must send all your students' marks to us by the date given at aqa.org.uk/deadlines. You will be asked to send a sample of your students' NEA evidence to your moderator.

You must show clearly how marks have been awarded against the assessment criteria in this specification. Your comments must help the moderator see, as precisely as possible, where you think the students have met the assessment criteria. You must:

- record your comments on the Candidate Record Form (CRF)
- check that the correct marks are written on the CRF and that the total is correct.

The moderator re-marks a sample of the evidence and compares this with the marks you have provided to check whether any changes are needed to bring the marking in line with our agreed standards. Any changes to marks will normally keep your rank order but, where major inconsistencies are found, we reserve the right to change the rank order.

School and college consortia

If you're in a consortium of schools or colleges with joint teaching arrangements (where students from different schools and colleges have been taught together but entered through the school or college at which they are on roll), you must let us know by:

- filling in the *Application for Centre Consortium Arrangements for centre-assessed work*, which is available from the JCQ website jcq.org.uk
- appointing a consortium coordinator who can speak to us on behalf of all schools and colleges in the consortium. If there are different coordinators for different specifications, a copy of the form must be sent in for each specification.

We'll allocate the same moderator to all schools and colleges in the consortium and treat the students as a single group for moderation.

5.9 After moderation

We will return your students' work to you after the exams. You'll also receive a report when the results are issued, which will give feedback on the appropriateness of the tasks set, interpretation of the marking criteria and how students performed in general.

We'll give you the final marks when the results are issued.

To meet Ofqual requirements, as well as for awarding, archiving or standardising purposes, we may need to keep some of your students' work. We'll let you know if we need to do this.

6 General administration

You can find information about all aspects of administration, as well as all the forms you need, at aqa.org.uk/examsadmin

6.1 Entries and codes

You only need to make one entry for each qualification – this will cover all the question papers, non-exam assessment and certification.

Every specification is given a national discount (classification) code by the Department for Education (DfE), which indicates its subject area.

If a student takes two specifications with the same discount code:

- further and higher education providers are likely to take the view that they have only achieved one of the two qualifications
- only one of them will be counted for the purpose of the *School and College Performance tables* – the DfE's rules on 'early entry' will determine which one.

Please check this before your students start their course.

Qualification title	AQA entry code	DfE discount code
AQA GCSE in Design and Technology	8552	TBC

This specification complies with:

- Ofqual *General conditions of recognition* that apply to all regulated qualifications
- Ofqual GCSE qualification level conditions that apply to all GCSEs
- Ofqual GCSE subject level conditions that apply to all GCSEs in this subject
- all other relevant regulatory documents.

The Ofqual qualification accreditation number (QAN) is 603/0984/2.

6.2 Overlaps with other qualifications

There are no overlaps with any other AQA qualifications at this level.

6.3 Awarding grades and reporting results

The qualification will be graded on a nine-point scale: 1 to 9 – where 9 is the best grade.

Students who fail to reach the minimum standard grade for grade 1 will be recorded as U (unclassified) and will not receive a qualification certificate.

6.4 Resits and shelf life

Students can resit the qualification as many times as they wish, within the shelf life of the qualification.

6.5 Previous learning and prerequisites

There are no previous learning requirements. Any requirements for entry to a course based on this specification are at the discretion of schools and colleges.

6.6 Access to assessment: diversity and inclusion

General qualifications are designed to prepare students for a wide range of occupations and further study. Therefore our qualifications must assess a wide range of competences.

The subject criteria have been assessed to see if any of the skills or knowledge required present any possible difficulty to any students, whatever their ethnic background, religion, sex, age, disability or sexuality. Tests of specific competences were only included if they were important to the subject.

As members of the Joint Council for Qualifications (JCQ) we participate in the production of the JCQ document *Access Arrangements and Reasonable Adjustments: General and Vocational qualifications*. We follow these guidelines when assessing the needs of individual students who may require an access arrangement or reasonable adjustment. This document is published at jcq.org.uk

Students with disabilities and special needs

We're required by the Equality Act 2010 to make reasonable adjustments to remove or lessen any disadvantage that affects a disabled student.

We can make arrangements for disabled students and students with special needs to help them access the assessments, as long as the competences being tested aren't changed. Access arrangements must be agreed **before** the assessment. For example, a Braille paper would be a reasonable adjustment for a Braille reader.

To arrange access arrangements or reasonable adjustments, you can apply using the online service at aqa.org.uk/eaqa

Special consideration

We can give special consideration to students who have been disadvantaged at the time of the assessment through no fault of their own – for example a temporary illness, injury or serious problem such as family bereavement. We can only do this **after** the assessment.

Your exams officer should apply online for special consideration at aqa.org.uk/eaqa

For more information and advice visit aqa.org.uk/access or email accessarrangementsqueries@aqa.org.uk

6.7 Working with AQA for the first time

If your school or college hasn't previously offered our specifications, you need to register as an AQA centre. Find out how at aqa.org.uk/becomeacentre

6.8 Private candidates

This specification is not available to private candidates.

6.9 Use of calculators

Students may use a calculator in the exam. They must ensure that their calculator meets the requirements as set out in the *JCQ Instructions for conducting examinations*. These instructions make it clear what the requirements are for calculators (what they must be) and what they are not (what they must not be). The instructions are regularly updated and can be found at jcq.org.uk

7 Appendix: Links to maths and science

As outlined in the DfE subject content document, through their work in design and technology students must apply relevant knowledge, skills and understanding from key stage 3 and 4 courses in the sciences and maths.

They should use the metric and International System of Units (SI) system but also be aware that some materials and components retain the use of imperial units.

Through the assessment of their knowledge and understanding of technical principles students must demonstrate an understanding of the mathematical and scientific requirements shown in the following tables. The examples in the tables below are illustrative of how the mathematical skills and scientific knowledge and skills identified could be applied in design and technology.

7.1 Links to maths

Students must be able to apply the following mathematical skills.

1 Arithmetic and numerical computation

Ref	Mathematical skills requirements	Examples of design and technology applications
1a	Recognise and use expressions in decimal and standard form.	Calculation of quantities of materials, costs and sizes.
1b	Use ratios, fractions and percentages.	Scaling drawings, analysing responses to user questionnaires.
1c	Calculate surface area and volume.	Determining quantities of materials.

2 Handling data

Ref	Mathematical skills requirements	Examples of design and technology applications
2a	Presentation of data, diagrams, bar charts and histograms.	Construct and interpret frequency tables; present information on design decisions.

3 Graphs

Ref	Mathematical skills requirements	Examples of design and technology applications
3a	Plot, draw and interpret appropriate graphs.	Analysis and presentation of performance data and client survey responses.
3b	Translate information between graphical and numeric form.	Extracting information from technical specifications.

4 Geometry and trigonometry

Ref	Mathematical skills requirements	Examples of design and technology applications
4a	Use angular measures in degrees.	Measurement and marking out, creating tessellated patterns.
4b	Visualise and represent 2D and 3D forms including two dimensional representations of 3D objects.	Graphic presentation of design ideas and communicating intentions to others.
4c	Calculate areas of triangles and rectangles, surface areas and volumes of cubes.	Determining the quantity of materials required.

7.2 Links to science

Students must know and apply the following scientific knowledge and skills.

1 Use scientific vocabulary, terminology and definitions

Ref	Scientific knowledge and skills requirements	Examples of design and technology applications
1a	Quantities, units and symbols.	Appropriate use of scientific terms when developing a design brief and specifications.
1b	SI units (eg kg, g, mg; km, m, mm; kJ, J), prefixes and powers of ten for orders of magnitude (eg tera, giga, mega, kilo, centi, milli, micro and nano).	Calculation of quantities, measurement of materials and selection of components.
1c	Metals and non-metals and the differences between them, on the basis of their characteristic physical and chemical properties.	Classification of the types and properties of a range of materials.

2 Life cycle assessment and recycling

Ref	Scientific knowledge and skills requirements	Examples of design and technology applications
2a	The basic principles in carrying out a life-cycle assessment of a material or product.	Selection of materials and components based on ethical factors, taking into consideration the ecological and social footprint of materials.

3 Using materials

Ref	Scientific knowledge and skills requirements	Examples of design and technology applications
3a	The conditions which cause corrosion and the process of corrosion and oxidisation.	Understanding of properties of materials and how they need to be protected from corrosion through surface treatments and finishes. Appreciate how oxidisation can be used when dyeing materials.
3b	The composition of some important alloys in relation to their properties and uses.	Selecting appropriate materials.
3c	The physical properties of [materials], how the properties of materials are selected related to their uses.	Knowledge of properties of materials to be applied when designing and making.
3d	The main energy sources available for use on Earth (including fossil fuels, nuclear fuel, bio-fuel, wind, hydro-electricity, the tides and the Sun), the ways in which they are used and the distinction between renewable and non- renewable sources.	Understanding of how to choose appropriate energy sources.
3e	The action of forces and how levers and gears transmit and transform the effects of forces.	Knowledge of the function of mechanical devices to produce different sorts of movement, changing the magnitude and direction of forces.

Get help and support

Visit our website for information, guidance, support and resources at

You can talk directly to the Design and Technology subject team:

E: dandt@aqa.org.uk

T: 0161 957 3334