OCR Level 1/2 GCSE (9–1) in Design and Technology (J310)

Specification

Awaiting Accreditation

Version 1 First assessment 2019

This draft qualification has not yet been accredited by Ofqual. It is published to enable teachers to have early sight of our proposed approach to GCSE (9–1) in Design and Technology. Further changes may be required and no assurance can be given at this time that the proposed qualification will be made available in its current form, or that it will be accredited in time for first teaching in 2017 and first award in 2019.

Contents

1 Why choose an OCR GCSE (9–1) in Design and Technology?

1a. Why choose an OCR qualification?

Choose OCR and you've got the reassurance that you're working with one of the UK's leading exam boards. Our new OCR GCSE (9–1) in Design and Technology course has been developed in consultation with teachers, employers and Higher Education to provide learners with a qualification that's relevant to them and meets their needs.

We're part of the Cambridge Assessment Group, Europe's largest assessment agency and a department of the University of Cambridge. Cambridge Assessment plays a leading role in developing and delivering assessments throughout the world, operating in over 150 countries.

We work with a range of education providers, including schools, colleges, workplaces and other institutions in both the public and private sectors. Over 13,000 centres choose our A Levels, GCSEs and vocational qualifications including Cambridge Nationals, Cambridge Technicals and Cambridge Progression.

Our Specifications

We believe in developing specifications that help you bring the subject to life and inspire your learners to achieve more.

We've created teacher–friendly specifications based on extensive research and engagement with the teaching community. They're designed to be straightforward and accessible so that you can tailor the delivery of the course to suit your needs. We aim to encourage students to become responsible for their own learning, confident in discussing ideas, innovative and engaged.

We provide a range of support services designed to help you at every stage, from preparation through to the delivery of our specifications. This includes:

- A wide range of high-quality creative resources including:
    - Delivery Guides
    - Transition Guides
    - Topic Exploration Packs
    - Lesson Elements
    - …and much more.
- Access to subject specialists to support you through the transition and throughout the lifetimes of the specifications.
- CPD/Training for teachers including face-to-face events to introduce the qualifications and prepare you for first teaching.
- Active Results – our free results analysis service to help you review the performance of individual learners or whole schools.
- ExamCreator – our new online past papers service that enables you to build your own test papers from past OCR exam questions.

All GCSE (9–1) qualifications offered by OCR are accredited by Ofqual, the Regulator for qualifications offered in England. The accreditation number for OCR's GCSE (9–1) in Design and Technology is QNXXXXXX

1b. Why choose an OCR GCSE (9–1) in Design and Technology?

Learning about design and technology will encourage learners to develop design and thinking skills that open up a world of possibility, giving them the tools to create the future. This specification will excite and engage learners with contemporary topics covering the breadth of this dynamic and evolving subject. It will generate empathetic learners who have the ability to confidently critique products, situations and society in every walk of their lives now and in the future.

Design and Technology is a subject that brings learning to life, requiring learners to apply their learning to real-life situations. This qualification aims to relate authentic real-world awareness of iterative design practices and strategies used by the creative, engineering and manufacturing industries. Learners will be required to use critical thinking leading towards invention and design innovation, to design and make prototypes that solve real and relevant problems, considering their own and others' needs, wants and values.

OCR's GCSE (9–1) in Design and Technology enables learners to progress from their learning in Key Stage 3 (KS3), developing critical thinking and practical skills that will serve them well in their futures, with A levels, Further Education, Higher Education or in the workplace.

Learners will build and develop their broad knowledge and understanding from KS3, whilst also having the freedom to focus in more depth on areas of design and technology that most interest them.

This qualification will give learners an opportunity to engage with creativity and innovation and understand how they can be enhanced by the application of knowledge from other disciplines across the curriculum such as mathematics, science, art and design, computing and humanities as well as the practical and technical knowledge and understanding they will learn from Design and Technology.

OCR has a comprehensive and dynamic support package in place for the delivery and understanding of this qualification, including a range of free resources available on our website, CPD opportunities and Design and Technology Subject Specialists who are available to support teachers. This support will continuously evolve to suit the requirements of teaching and learning through the lifetime of the specification, based on continued feedback from teachers.

Aims and learning outcomes

OCR's GCSE (9–1) in Design and Technology will encourage learners to:

- develop an awareness and understanding of real-life experiences in designing and in the developments and opportunities seen in creative, manufacturing and engineering industries
- demonstrate their understanding that all design and technological activity takes place within contexts that influence the outcomes of design practice
- develop an experienced understanding of an iterative design process and the relevance of these to industry practice
- develop realistic design proposals as a result of the exploration of design opportunities and users' (and stakeholders) 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
- become independent and critical thinkers who can adapt their technical knowledge and understanding to different design situations
- 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
- engage learners with routes that are open to them when progressing to a GCE qualification, apprenticeship or in a future career in the field.

1c. What are the key features of this specification?

The key features of OCR's GCSE (9–1) in Design and Technology for you and your learners are:

- clarity on the application of iterative designing to support teaching and learning
- a specification that encourages creative thinking leading to design innovation, by using authentic and contemporary design strategies and techniques that are centred around iterative design processes of 'explore / create / evaluate', thus preparing learners to become critical and innovative designers, engineers and consumers of the future
- a flexible, dynamic and engaging support package for teachers developed through listening to teachers' needs and working with industry and educational professionals to ensure relevance. The support package is designed to evolve to support teachers' delivery and continuing CPD and keep teachers and learners up-to-date with contemporary practice and research in design, technology and engineering
- freedom in approaches towards designing and making so as not to limit the possibilities of project work or the materials and processes being used
- clear marking criteria for non-exam assessment that supports internal marking and preparatory teaching and learning, rewarding iterative design processes, problem solving and creative thinking
- examined assessment that supports both a practical and exploratory approach to learning, keeping all assessment relevant and purposeful to industry and learners' design interests
- supported by research, authentic practices and contextual challenges developed by DOT*
- a specification that offers clear progression through to AS and A Level qualifications in Design and Technology
- a glossary to explain key terms and clarify definitions from the specification content (see Section 5e).

* OCR have drawn research and authentic practices of an initiative called Designing Our Tomorrow (DOT), from University of Cambridge.

Designing Our Tomorrow

1d. How do I find out more information?

If you are already using OCR specifications you can contact us at: www.ocr.org.uk

If you are not already a registered OCR centre then you can find out more information on the benefits of becoming one at: www.ocr.org.uk

If you are not yet an approved centre and would like to become one go to: www.ocr.org.uk

Want to find out more?

Contact a Subject Specialist:
Email: D&T@ocr.org.uk
Phone: 01223 553998

Explore our teacher support:
http://www.ocr.org.uk/qualifications/by-subject/design-and-technology/

Join our communities:
Twitter: @OCR_DesignTech
OCR Community:
http://social.ocr.org.uk/groups/design-technology

Check what CPD events are available:
www.cpdhub.ocr.org.uk

2 The specification overview

2a. OCR's GCSE (9–1) in Design and Technology (J310)

There are two submission options for the non-exam assessment (NEA). These options determine the entries, but do not signify different routes through the qualification. Learners must take either:

- components 01 and 02 for OCR repository submission option, or
- components 01 and 03 for Postal submission option

in order to be awarded the OCR GCSE (9–1) in Design and Technology.

Content Overview	Assessment Overview	
This component brings together the learners 'core' and 'in-depth' knowledge and understanding. • '**Core**' knowledge of design and technology principles demonstrates learners' broad understanding of principles that all learners should have across the subject. • '**In-depth**' knowledge allows learners to focus more directly on **at least one** main material category, or design engineering. The question paper is split into two sections. A minimum of 15% of the paper will assess learners' mathematical skills as applied within a design and technology context.	**Principles of Design and Technology* (01)** 100 marks 2 hours Written paper	**50%** of total GCSE (9–1)
This component offers the opportunity for learners to demonstrate understanding of and skills in iterative designing, in particular: • the interrelated nature of the processes used to identify needs and requirements (explore) • creating solutions to meet those needs (create) • evaluating whether the needs have been met (evaluate). As an outcome of their challenge, learners will produce a chronological portfolio and one final prototype(s). It is through the iterative processes of designing that learners draw on their wider knowledge and understanding of design and technology principles. Contextual challenges will be released on 1 June each year.	**Iterative Design Challenge* (02, 03)** 100 marks Approx. 40 hours Non-exam assessment	**50%** of total GCSE (9–1)

* Indicates inclusion of synoptic assessment (see Section 3g).

Learners who are retaking the qualification may carry forward their result for the non-exam assessment component, See Section 4d.

2b. Content of GCSE (9–1) in Design and Technology (J310)

Central to the content of this qualification is the requirement for learners to understand and apply processes of iterative designing in their design and technology practice. They will need to demonstrate their knowledge, understanding and skills through interrelated iterative processes that ‘explore’ needs, ‘create’ solutions and ‘evaluate’ how well the needs have been met.

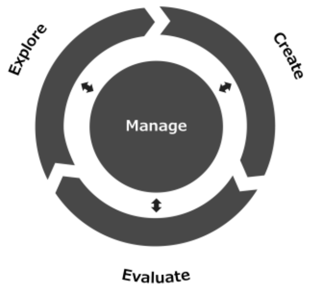

Fig. 1 Iterative Design Wheel
© Designing Our Tomorrow, University of Cambridge

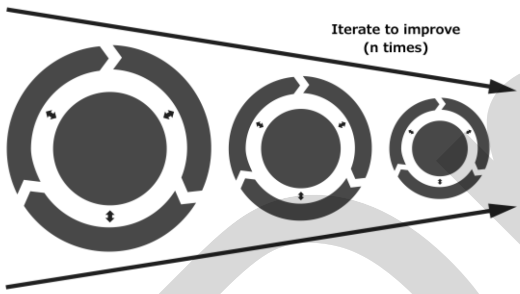

Fig. 2 Multiple iterations of design
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At the centre of any iterative process is the need to develop critical-creative thinking skills to manage and organise opportunities that are identified. This learning will equip learners with life-long skills of problem spotting and problem solving, and enable them to apply their learning to different social, moral and commercial contexts.

The enquiry based nature of this specification will encourage learners to make meaningful connections between explore, create and evaluate. It facilitates a creative approach supported by subject knowledge in order to design and make prototypes that solve authentic, real-world problems.

The knowledge, understanding and skills that all learners must develop are underpinned by technical principles and principles of designing and making.

Technical principles will predominantly be assessed in the written exam and designing and making principles predominantly in the non-exam assessment (NEA). There is an expectation for learners to reflect on their understanding of all of the principles of design and technology in both components. This is outlined further in Section 3g of this specification.

The content of the qualification has been divided up to identify the requirements of examined and non-exam assessment. There are 8 topic areas to guide both components and give clarity, these are:

1. Identifying requirements
2. Learning from existing products and practice
3. Implications of wider issues
4. Design thinking and communication
5. Material considerations
6. Technical understanding
7. Manufacturing processes and techniques
8. Viability of design solutions.

Experiencing learning through practical activity, (both designing and technical principles) is fundamental to the delivery of this specification, as is the importance of the contextual relevance of design and technology practice. To prepare learners to successfully complete the ‘Iterative Design Challenge’, they should increasingly be given autonomy to make decisions in order to justify their reasoning when solving problems in their own way.

The content does not restrict learners’ approaches to the qualification in terms of the materials and process they can use, but it does set out minimum requirements. Centres should use their discretion to allow learners to approach areas of designing and making that are appropriate to the facilities and resources available to them, whilst ensuring the right level of challenge.

Design and Technology requires learners to apply mathematical skills and understand related science. This reflects the importance of Design and Technology as a pivotal STEM subject. This specification requires learners to build on their prior learning in Design and Technology and other subjects at Key Stage 3 in order to develop their understanding of this importance.

2c. Content of Principles of Design and Technology (J310/01)

The specification content is set out through an enquiry approach to support teaching and learning. In addition, ‘core’ and ‘in-depth’ principles are highlighted throughout the content to demonstrate the required levels of knowledge, understanding and application that learners should develop in relation to each part of the content.

The **‘core’** principles of design and technology offer a broad set of principles that all learners must know regardless of their specific practical experiences. These principles are required so that learners are able to make informed choices as a designer and demonstrate their fundamental knowledge and understanding of the subject. The ‘core’ content of the exam draws and builds on prior knowledge covered in the Key Stage 3 curriculum of study.

Where learners are required to demonstrate their **‘in-depth’** knowledge, understanding and design development skills, this will relate to the specific experiences they have pursued throughout their Design and Technology learning. When designing and/or making, learners will build an in-depth toolkit of knowledge, understanding and skills in relation to materials or systems they have worked with and have an interest in.

Learners should build in-depth knowledge, understanding and design development skills that relate to one or more of the following main categories of materials:

- papers and boards
- natural and manufactured timber
- ferrous and non-ferrous metals
- thermo and thermosetting polymers
- natural, synthetic, blended and mixed fibres, and woven, non-woven and knitted textiles.

Alternatively some candidates may choose to follow the **design engineering** requirements if they have more of an interest and in-depth understanding of electronic and mechanical systems and control. This path still requires much of the same in-depth knowledge, but there will be more of a focus on parts 6.3 and 6.4 of the content.

All learners are also required in the exam to demonstrate their mathematical skills and scientific knowledge that are applied to design and technology practice. The required mathematical skills are outlined at the end of the exam content help interpret how they should be considered for application. The scientific knowledge is integrated into the content.

The level of mathematical and scientific knowledge within this qualification should be equivalent to Key Stage 3 learning. Both the mathematical and scientific requirements are outlined in more detail in sections 5c and 5d to demonstrate this.

Within the content, symbols are used to clearly identify examples where mathematics and/or science could be considered relevant:

 = Maths

 = Science

The level of mathematical requirement for the written examination is outlined at the end of this section. Where mathematical skills are learnt through ‘in-depth’ areas, learners should be able apply this learning to other broader contexts.

The specification content should be underpinned by understanding and applying it to a range of contextual approaches allowing learners to develop skills, knowledge and understanding through iterative designing, innovation and communication; studying materials and technologies; working with materials and technologies; considering manufacture and production methods; critiquing; exploring existing products and considering values and ethics.

The content has two columns to indicate with a tick (✔) whether the content relates to ‘core’ principles or ‘in-depth’ principles to support appropriate levels of teaching and learning.

1. Identifying requirements

	Considerations	*Core*	*In-depth*
DESIGNING PRINCIPLES	**1.1 How can exploring the context a design solution is intended for inform decisions and outcomes?**		
	a. Considerations for exploring a context should include: i. where and how the product or system is used ii. primary user and wider stakeholder considerations iii. social, cultural, moral and economic considerations.	✔	✔
TECHNICAL PRINCIPLES	**1.2 Why is usability an important consideration when designing prototypes?**		
	a. Considerations in relation to user interaction with design solutions, including: i. the impact of a solution on a user's lifestyle ii. the ease of use and inclusivity of design solutions iii. ergonomic considerations and anthropometric data to support ease of use iv. aesthetic considerations.	✔	

2. Learning from existing products and practice

	Considerations	*Core*	*In-depth*
DESIGNING PRINCIPLES	**2.1 What are the opportunities and constraints that influence design and making requirements?**		
	a. Exploration and critique of existing designs, systems and products to identify features and methods, considerations should include; i. the materials, components and processes that have been used ii. the influence of fashion, trends, taste and/or style iii. the influence of marketing and branding iv. the impact on society v. the impact on usability vi. the impact on the environment; life cycle assessment.	✔	
TECHNICAL PRINCIPLES	**2.2 How do developments in design and technology influence design decisions and practice?**		
	a. Critical evaluation of how new and emerging technologies influence and inform design decisions, considering both contemporary and potential future scenarios from the perspectives, such as: • ethics • the environment • product enhancement.	✔	

3. Implications of wider issues

TECHNICAL PRINCIPLES

Considerations	*Core*	*In-depth*
3.1 What are the impacts of new and emerging technologies when developing design solutions?		
a. Consideration of ethical and environmental influences, such as: • environmental initiatives • fairtrade • social and ethical awareness • global sustainable development.	✔	
b. Exploration of the impacts within different contexts on: i. industry and enterprise, such as the circular economy ii. people in relation to; lifestyle, culture and society iii. the environment iv. sustainability.	✔	
3.2 How do designers choose appropriate sources of energy to make products and power systems?		
a. The generation of electricity and how energy is stored and transferred.	✔	
b. The appropriate use in products and systems of renewable and non-renewable sources including: i. fossil fuels, nuclear fuel, bio-fuel ii. wind, hydro-electricity, tidal and solar.	✔	

4. Design thinking and communication

DESIGNING PRINCIPLES

Considerations	*Core*	*In-depth*
4.1 How can design solutions be communicated to demonstrate their suitability?		
a. The use of graphical techniques to communicate ideas, modifications, constructional and technical considerations, such as: • clear 2D and 3D sketches with notes • sketch modelling • exploded drawings • mathematical modelling.		✔
4.2 How do designers source information and thinking when problem solving?		
a. Awareness of different design approaches, including: i. user-centred design ii. systems thinking.	✔	
b. The importance of collaboration to gain specialist knowledge from across subject areas when delivering solutions in design and manufacturing industries.	✔	

5. Material considerations

TECHNICAL PRINCIPLES

Considerations	*Core*	*In-depth*
5.1 What are the main categories of materials available to designers when developing design solutions?		
Understanding that products are predominantly made from multiple materials. An overview of the **main categories** of materials as follows: a. papers and boards, including: i. papers, e.g.; layout and cartridge ii. card, e.g.; carton board, bleached card and corrugated card iii. boards/sheets, e.g.; foam board, Styrofoam and polypropylene sheet iv. laminated layers, e.g.; reflective surfaces. b. natural and manufactured timber, including: i. hardwoods, e.g.; oak, birch and teak ii. softwood, e.g.; pine, cedar and spruce iii. manufactured boards, e.g.; MDF, plywood and block board. c. ferrous and non-ferrous metals, including: i. ferrous metals, e.g.; iron, mild steel and stainless steel ii. non-ferrous metals, e.g.; aluminium, copper and tin iii. alloys, e.g.; brass, pewter and tin/lead solder. d. thermo and thermosetting polymers, including: i. thermo polymers, e.g.; PET, HDPE, PVC, LDPE, PS, PP, ABS, acrylic and TPE ii. thermosetting polymers, e.g.; silicone; epoxy resin and polyester resin. e. textile fibres and fabrics, including: i. natural fibres, e.g.; cotton, wool and silk ii. synthetic fibres, e.g.; nylon, polyester and acrylic iii. mixed/blended fibres, e.g.; cotton/polyester iv. woven, non-woven and knitted fabrics.	✔	
f. Awareness of developments in: i. modern and smart materials such as graphene, super alloys, biopolymers and nano-materials ii. composite materials and their purpose in relation to contrasting applications iii. technical textiles used in different types of products dependent on context.	✔	
5.2 Why is it important to consider the characteristics and properties of materials and/or system components when designing?		
a. The characteristic properties of the **main categories** of materials (5.1a-e, not the specific materials) and why this makes them appropriate for different uses, such as: • density, strength, hardness, durability, strength to weight ratio, stiffness, elasticity, impact resistance, plasticity, corrosive resistance to chemicals and weather, flammability, absorbency, thermal and electrical conductivity.	✔	

TECHNICAL PRINCIPLES	b. The physical and working properties of **specific materials** and/or **system components**, with consideration of: i. how easy they are to work with ii. how well they fulfil the required functions of products in different contexts.		✔
	5.3 Why is it important to understand the sources or origins of materials and/or system components?		
	a. The sources and origins of **specific materials** and/or **system components**.		✔
	b. An overview of the processes used to extract and/or convert the source material into a workable form.		✔
	c. Consideration of the ecological, social and ethical issues associated with processing **specific materials** and/or **system components** to convert them into workable forms, such as: • mining, harvesting, manufacturing, transporting.		✔
	d. The lifecycle of **specific materials** and/or **system components** when used in products.		✔
	e. Consideration of recycling, reuse and disposal of **specific materials** and/or **system components**, such as: • recycling and sustainability schemes, eco-materials, upcycling.		✔
	5.4 Why is it important to know the different available forms of specific materials and/or systems components?		
	a. Awareness of commonly available forms and standard units of measurement of **specific materials** and/or **system components** when calculating costs and quantities, including: i. weights and sizes ii. stock forms, such as: o lengths, sheets, pellets, reels, rolls, rods. iii. standard components, such as: o paper and boards, e.g.; clips, fasteners, bindings o timber, e.g.; hinges, brackets, screws o metals, e.g.; bolts, rivets, hinges o polymers, e.g.; caps, fasteners, bolts o fibres and fabrics; zips, buttons, poppers. o system components, e.g.; resistors, capacitors, diodes, transistors and drivers, microcontrollers. o mechanical components, e.g.; gears and cams, pulleys and belts, levers and linkages.		✔

6. Technical understanding

TECHNICAL PRINCIPLES

Considerations	*Core*	*In-depth*
6.1 What gives a product structural integrity?		
a. How and why **specific** materials and/or **system components** need to be reinforced or stiffened to withstand forces and stresses.		✔ ⚗
b. Awareness of the processes that can be used to ensure the structural integrity of a product, such as: • triangulation • use of boning, darts and layering in textile products • plastic webbing • reinforcing.		✔ ⚗
6.2 How can materials and products be finished for different purposes?		
a. The processes used for finishing and adding surface treatments to materials and products for specific purposes, including: i. function, such as; durability and added resistance to overcome environmental factors ii. aesthetics.		✔ ⚗
6.3 How do we introduce controlled movement to products and systems?		
a. An overview of the functions of mechanical devices, to produce different sorts of movement and types of motion, including: i. rotary ii. linear iii. oscillating iv. reciprocating.	✔ ⚗	
b. The effect of forces on the ease of movement, including: i. load ii. effort iii. fulcrum.	✔ ⚗	
c. How to change the magnitude and direction of forces.	✔ ⚗	
6.4 How do electronic systems provide functionality to products and processes?		
a. How simple electronic systems provide process control functions, including: i. INPUT switches and sensors, to respond to a variety of input signals, such as; light dependent resistor (LDR), tilt switch, infra-red sensor ii. OUTPUT devices to produce a variety of outputs including light, sound and motion, such as; motor, speaker, light emitting diode (LED).	✔ ⚗	
b. How programmable components can be embedded into products in order to enhance and customise their operational function.	✔ ⚗	

7. Manufacturing processes and techniques

TECHNICAL PRINCIPLES

Considerations	*Core*	*In-depth*
7.1 How can materials and processes be used to make iterative models?		
a. The processes and techniques used to produce early models and/or toiles to support iterative designing.		✔
7.2 How can materials be manipulated and joined in different ways in a workshop environment when making final prototypes?		
a. The use of specialist techniques used to shape, fabricate, construct and assemble high quality prototypes, with exemplification of the following processes: i. wastage, such as: o paper and boards; cutting and punching o timber; sawing, drilling and turning o metals; sawing, drilling, sheering and turning o polymers; sawing and drilling o fibres and fabrics; cutting and shearing o design engineering; etching*. ii. addition, such as: o paper and boards; adhesion and laminating o timber; adhesion, joining and laminating o metals; adhesion, welding/braising and riveting o polymers; adhesion and heat welding o fibres and fabrics; sewing, bonding and laminating o design engineering; soldering*. iii. deforming and reforming, such as: o paper and boards; perforating and folding o timber; steaming and pressing o metals; pressing, bending and casting o polymers; moulding, vacuum forming and line bending o fibres and fabrics; heat treatments, pleating and gathering o design engineering; moulding*. * *and other processes appropriate to the materials or components being used*		✔
7.3 How do industry professionals use digital design tools when exploring and developing design ideas?		
a. The use of 2D and 3D digital technology and tools are used to present, model, design and manufacture solutions, such as: • rapid prototyping • image creation and manipulation software • digital manufacture • interpretation of plans, elevations of 3D models • CAD, CAM, CAE.		✔
7.4 How do processes vary when manufacturing products to different scales of production?		
a. The methods used for manufacturing at different scales of production, such as: • one-off, bespoke production • batch production • mass production • lean manufacturing and just-in-time (JIT) methods.		✔

		Core	In-depth
TECHNICAL PRINCIPLES	b. Awareness of manufacturing processes used for larger scales of production, such as: • paper and boards; offset lithography, screen process printing, digital printing, vinyl cutting, die cutting • timber; CNC routers, sawing and steam bending machines and lathes • metals; CNC milling, turning, sheet metal folding, pressing and stamping; sand and die casting. • polymers; compression moulding, injection moulding, vacuum forming, rotational moulding, extrusion and blow moulding • fibres and fabrics; band saw cutting, flatbed and rotary screen printing, digital lay planning, industrial sewing machines and overlockers, automated presses and steam dollies • design engineering; laser cutting, rapid prototyping and 3D printing.		✔
	c. Methods of ensuring accuracy and efficiency when manufacturing in larger scales, such as: • use of jigs, templates, moulds or formers, digital technology.		✔
	7.5 How do new and emerging technologies have an impact on production techniques and systems?		
	a. Critical evaluation of the benefits and implications of incorporating new and emerging technologies into production processes, such as: • consideration of economies of scale • how disruptive technologies such as 3D printing and robotics are changing manufacturing.	✔	

8. Viability of design solutions			
	Considerations	*Core*	*In-depth*
TECHNICAL PRINCIPLES	**8.1 How can cost and availability of specific materials and/or system components affect their selection when designing?**		
	a. The significance of the cost of **specific materials** and/or **system components** in relation to commercial viability, different stakeholder needs and marketability.		✔
	b. How to calculate the quantities, cost and sizes of materials and/or system components required in a design or product, being able to apply this to different applications.		✔
	c. Consideration of suitable tolerances and minimisation of waste to make designs viable.		✔

Mathematical skills in the Principles exam

It is a requirement of this qualification that a minimum of 15% of the written exam assesses the use of mathematical skills at a level of demand which is not lower than that expected at Key Stage 3. In order to support this application of skills the following table demonstrates how these skills may be assessed within a written exam.

The content in the specification with the Maths symbols indicates content that this may be assessed against.

Where mathematical skills are learnt through 'in-depth' areas, learners should be able apply this learning to other broader contexts.

Learners are permitted to use a scientific or graphical calculator for this written examination. Calculators are subject to the rules in the document *Instructions for Conducting Examinations* published annually by JCQ (www.jcq.org.uk). However, it is expected that how a calculation was reached should be shown by a learner in their responses.

M1 Calculating quantities, cost and sizes of materials and design solutions

Learners should be able to:

a. understand the standard application of metric units used in design and technology and apply these appropriately using standard form (also be aware that some materials and components retain the use of imperial units)
b. calculate the surface area of triangular and rectangular materials and design solutions
c. calculate the surface areas and volumes of cuboid within design solutions
d. calculate the quantities of materials used in their products considering tolerances as appropriate
e. calculate the cost of materials used in their products considering profits
f. use standard units of mass, length, time, money and other measures using decimal quantities where appropriate.

M2 Accuracy and resourcefulness

Learners should be able to:

a. understand how tessellated patterns are used to minimise waste
b. understand the use of tolerance when developing design solutions.

M3 Presenting and interpreting drawings and models

Learners should be able to:

a. understand and use ratios to calculate the scaling of drawings
b. present accurate 2D and 3D graphics to communicate design solutions
c. be able to interpret 3D models in order to draw 2D perspectives that can be used to communicate intentions and instructions to others.

M4 Interpreting data

Learners should be able to:

a. use appropriate methods to present performance data, survey responses and information on design decisions, including the use of frequency tables, graphs and bar charts.
b. understand and apply fractions and percentages when analysing data given in tables and charts
c. interpret and extract appropriate data from technical and graphical sources.

Further details on the forms of assessment for examinations can be found in Section 3a.

The mathematical requirements are mapped out further in Section 5c.

2d. Non-exam assessment content – Iterative Design Challenge (J310/02, 03)

The non-exam assessment for this qualification requires learners to demonstrate their ability to draw together different areas of knowledge and understanding from across the full course of study through a single 'challenge' project – the 'Iterative Design Challenge'.

At the heart of any iterative design challenge are three interrelated processes, requiring learners to:

- 'explore' needs
- 'create' solutions that demonstrate how the needs can be met
- 'evaluate' how well the needs have been met.

The above processes occur repeatedly as iterations throughout any process of designing prototyped solutions. This continual system of designing ensures constantly evolving iterations that build clearer needs and better solutions for a concept so that the ideas and prototypes can be developed into successful products. Learners will be required as a result of their Iterative Design Challenge to produce one final prototype or a set of prototypes that work in conjunction.

Central to any iterative designing process is the thinking and management around the development of the processes (centre circle in Fig. 3). This requires learners to manage competing problems to prioritise requirements in order to progress with their challenge. Taking calculated risks and managing them are an inherent part of this learning experience and should not be hidden, but encouraged as an integral and necessary aspect of iterative designing. Reflecting on problem solving through design iterations should be evidenced throughout.

The content of the non-exam assessment is laid out to clarify the iterative processes of 'explore/create/evaluate' and to highlight how the content requirements are not restricted to a single part/stage of an iterative designing challenge.

Learners are required to demonstrate their understanding that design and technology activity exists in contexts that influence the outcomes. Three different contextual challenges will be set by OCR each year in order for learners to explore a challenge that they can relate to. The challenges will:

- offer a broad range of real-world contexts, representing contemporary issues and concerns
- be open-ended, avoiding predetermining the materials or processes to be used to achieve a design solution
- focus on needs, wants and values of different groups, leading learners to address problems and/or opportunities
- be accessible and relevant to all learners regardless of areas they may have covered 'in-depth'.

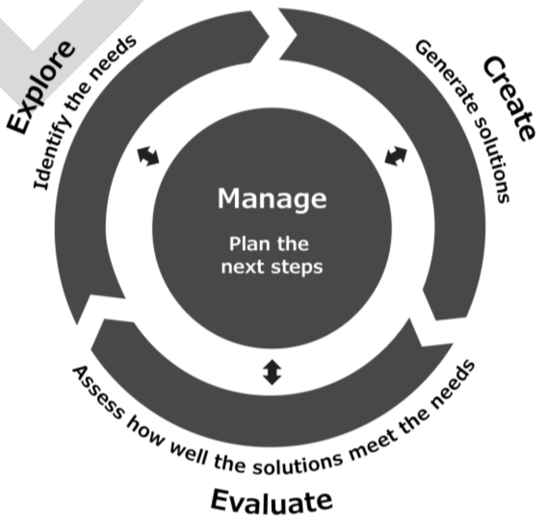

Fig. 3 Iterative Design Wheel showing key activities
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Explore (AO1)

Exploring is about systematically understanding the need(s), known as requirements, of the stakeholder(s). The requirements should be described in a way that stimulates the 'create' stage of design development and forms the basis of measurable evaluation criteria in the 'evaluation' stage of the process. The requirements can be derived by exploring the following questions:

- *Who* are the stakeholders? e.g. using personas
- *What* do stakeholders do and *when* do they do it? e.g. using task analysis
- *Where* do stakeholders do it? e.g. through primary and secondary research that helps understand the physical, organisational, social and cultural environments
- *Why* do stakeholders do what they do? e.g. establishing what stakeholders want to achieve
- What is the impact of what stakeholders do on society (people), the environment (planet) and economics (profit)?

Create (AO2)

Creating focuses on the mental processes that are associated with creative thought. Creative ideas/products have to be both *novel* and *appropriate* (or functional in design terms). In order to be *novel,* ideas must go beyond clichéd or stereotypical responses- something known as [design] fixation. Recognising fixation and understanding the conceptual processes that help avoid it, is crucial to creative thought. For example, the process of conceptual combination, which is the merging of two or more concepts to form a *novel* idea, which, if *appropriate*, is by definition creative.

Suitable communication and presentation techniques are essential to record and share creative thoughts clearly to a third party. Initially, the focus is on the generation of a wide variety of ideas, using quick methods of communication such as freehand sketching. There is absolutely the freedom for learners to approach their designing in the way they feel most appropriate, e.g. with the use of digital technology or rudimentary models. Working up rough prototypes of ideas using readily available materials allows evaluation for future iterations. The presentation of later iterations may include techniques such as detailed sketches, more substantive models and photos of models with annotations of technical requirements and general thoughts. Learners' final design solutions can similarly be presented in any medium, but should be drawn with enough skill and detail to show relevant technical details, projections and rendering, resulting in a functioning prototype that resembles the intended iterative design solution for presentation and evaluation. The final design solution will also be required to be presented through the making of a final functioning and quality prototype.

Ideas in the form of sketches, models and annotations as described as part of the 'create' stage should be tested and evaluated as described as part of the 'evaluate' stage. In this way, the learner's creative journey is recorded naturally and clearly communicates their creative and critical thought processes and an understanding of how 'explore', 'create', and 'evaluate' are interrelated.

Evaluate (AO3)

Evaluation establishes whether the need(s) of the user(s) have been met. Ideas (sketches and models) generated and developed within 'create' are used to test and systematically evaluate their *appropriateness* against the stakeholder requirements identified as part of 'explore'. Where needs have not been satisfactorily met, more exploration and creating of ideas will be required. New or developed ideas will need to be systematically evaluated.

This iterative process is repeated until all user-needs have been met in line with stakeholder requirements. Each evaluation informs the next iteration and should be evident throughout the learner's challenge project. In order to do this, learners should select from a variety of suitable techniques that will help them to objectively test the solutions developed to meet the identified stakeholder requirements.

NEA content requirement

The column on the left indicates where learners may consider mathematical skills or science knowledge.

The ‘explore’, ‘create’ and ‘evaluate’ columns have different size dots, not only to indicate their interrelationship, but also their significance within any topic strand.

In order to undertake their Iterative Design Challenge, learners should:

	1. Identify requirements	**Explore**	**Create**	**Evaluate**	**Maths and Science**
DESIGNING PRINCIPLES	a. Understand that all design and technological practice takes place within contexts that inform outcomes, learners should be able to identify and prioritise issues that are relevant to their chosen context. These issues should be reflected on throughout their project.	⬤	●	●	
	b. Be able to write a design brief in response to a contextual challenge that considers human needs, wants and interests.	⬤	•	•	
	c. Investigate, identify and understand the needs and requirements of primary users and other stakeholders through collecting, analysing and presenting their findings from primary and secondary data.	⬤	•	●	
	2. Learning from existing products and practice				
DESIGN AND MAKING PRINCIPLES	a. Investigate and analyse relevant existing products, understanding how they are used within their physical, organisational, social and/or cultural environments using methods such as disassembly and systems thinking in order to make informed and reasoned decisions.	⬤	•	●	
	b. Investigate and analyse the wider work of professionals and companies in order to stimulate their own design thinking.	⬤	●	●	
	3. Implications of wider issues				
DESIGNING PRINCIPLES	a. Investigate factors, such as environmental, social and economic challenges, in order to identify opportunities and constraints that might influence the process of iterative designing and making. For example, taking into consideration the ecological and social footprint of materials.	●	•	•	 

4. Design thinking and communication		Explore	Create	Evaluate	Maths and Science
DESIGN AND MAKING PRINCIPLES	a. Demonstrate an ability to formulate appropriate specifications reflecting on their own investigations and considering stakeholder requirements. These can be both technical and non-technical specifications, for example: • requirements lists • product specifications • material specifications.	●	•	●	
	b. Be able to use different design strategies and approaches such as collaboration, user-centred design and systems thinking when generating and developing innovative design ideas that avoid design fixation.	•	●	•	
	c. Be able to design and develop at least one prototype that responds to needs and/or wants and is fit for purpose, demonstrating functionality, aesthetics and marketability.	•	●	•	
	d. Apply techniques in order to communicate and record design ideas suitable to the stage of development in order to justify their own thinking and present their thinking and intentions to a third party, for example: • informal 2D and 3D sketching and modelling to communicate initial ideas • system and schematic diagrams, annotated sketches, exploded diagrams, models and written notes, to communicate development iterations • audio and visual recordings to share thinking, explorations and the functionality of ideas • formal 2D and 3D working drawings, mathematical modelling and computer based tools to present final ideas; schedules and flow charts to deliver planning • presentations and real-time evidence to communicate the entire project.	·	●	·	
5. Material considerations					
TECHNICAL PRINCIPLES	a. Develop and apply in-depth knowledge by selecting and working with appropriate materials and components when developing their ideas, early models and producing their final prototype(s).	•	•	·	
6. Technical understanding					
TECHNICAL PRINCIPLES	a. Apply technical principles appropriately to ensure functional requirements are achieved when developing a design solution.	·	·	·	 
	b. Be able to use surface treatments and finishes for functional and aesthetic purposes.	·	·	·	

7. Manufacturing processes and techniques			Explore	Create	Evaluate	Maths and Science
DESIGNING AND MAKING PRINCIPLES	a.	Be able to use specialist techniques and processes to shape, fabricate, construct and assemble at least one high quality prototype, including techniques such as wastage, addition, deforming and reforming, as appropriate to the materials and/or system components being used.	•	●	•	
	b.	Be able to use specialist tools and equipment, appropriate to the materials or system components used (including hand tools, machinery, digital design and manufacture), to create models and prototypes.	•	●	•	
	c.	Be able to use appropriate and accurate marking out methods including: measuring and use of reference points, lines and surfaces; use templates, jigs and/or patterns where appropriate; work within tolerances; understand efficient cutting and how to minimise waste.	•	●	•	
8. Viability of design solutions						
DESIGNING PRINCIPLES	a.	Be able to test, critically analyse and evaluate their design solutions against the identified stakeholder requirements, design opportunities and constraints in order to refine and improve future iterations.	•	•	●	
	b.	Be able to make informed and reasoned decisions throughout the iterative design process, responding to feedback as appropriate.	•	•	●	
	c.	Be able to respond to feedback given by others about their prototype(s) in order to identify the potential for further development and suggest how modifications could be made through design optimisation.	•	●	●	

Further details on the requirements for undertaking the non-exam assessment (NEA) can be found in Section 3a. Guidance on assessment of the NEA, including the marking criteria is outlined in Section 3f. Administration requirements of the NEA are outlined in Section 4d.

Health and Safety is not an assessment requirement of this qualification, however, there will always be a requirement of Health and Safety standards to be met in any workshop environment and the learners should be fully aware of relevant regulations and requirements.

Mathematical skills in the NEA

In order to support the mathematical skills that are required to be assessed in the non-exam assessment (NEA), there is an expectation within this specification that learners will continue to demonstrate appropriate mathematical skills. The application of these skills should not be used artificially, but appropriately as opportunities arise. See Section 5c for further information. Within the NEA the following skills could be drawn on:

- appropriate use of measurements using metric units to ensure accuracy and minimise waste
- calculations of material and component costs and quantities considering appropriate tolerances and resourcefulness
- utilising and interpreting appropriate data to support the development of design iterations
- use appropriate methods to present performance data, survey responses and information on design decision, including the use of frequency tables, graphs and bar charts
- accurate graphical communication to deliver design and manufacturing intentions to others.

2e. Prior knowledge, learning and progression

Learners in England who are beginning this GCSE (9–1) course are likely to have followed a Key Stage 3 programme of study in Design and Technology. However, no prior qualification, knowledge or understanding is required. Though this prior learning will greatly support learning in this qualification.

GCSEs are qualifications that enable learners to progress to further qualifications, either vocational or general. This qualification provides the ideal foundation for learners to progress to either an OCR Cambridge Technical in Engineering, or to OCR AS or A Level Design and Technology with endorsed titles in Design Engineering, Fashion and Textiles or Product Design.

There are links to mathematics and science content within this specification. Where this is to be assessed, the standard level will be equivalent to the learning that expected at the end of Key Stage 3.

Find out more at www.ocr.org.uk

3 Assessment of GCSE (9–1) in Design and Technology

3a. Forms of assessment

OCR's GCSE (9–1) in Design and Technology is a linear qualification with 50% external assessment by examination and 50% through non-exam assessment (NEA) internally assessed by the centre and externally moderated by OCR. Learners must take both components.

Principles of design and technology (01) written examination

This is a single examination component with questions covering both 'core' and 'in-depth' content. The component is externally assessed.

Principles of design and technology	
50% of GCSE (9–1) 2 hours Drawn and written paper 100 marks 'Core' principles equate to approximately 60% and 'In-depth' principles equate to approximately 40% of the exam.	This paper covers the full extent of the examined content. The questions offer full access to all learners regardless of their practical experiences in the subject. When learners are required to demonstrate their 'in-depth' knowledge, understanding and skills, sufficient optionality will be offered to ensure each of **main material categories** and **design engineering** can all be accessed. The paper is split into two sections. **Section A** (55 marks) This section of the paper consists of three sets of wider questions that predominantly require learners to demonstrate their 'core' knowledge, however there may be some questions that rely on learners to drawn on their 'in-depth' toolkit of knowledge. • Learners will be required to answer **all** questions. • The will be a mixture of different levels of questions. • There will be **one extended response question**. **Section B** (45 marks) This section of the paper will predominantly assess 'in-depth' knowledge. Learners will be able to choose a product within a situational context in order to demonstrate their deeper understanding of materials and/or systems and the developments and manufacture of prototypes and products in relation to their main area of learning. • Learners will be required to answer **all** questions. • The will be a mixture of different levels of questions. • The questions will have a main focus on the in-depth knowledge within Sections 5, 6 and 7 of the exam content. • There will be **one extended response question**. A minimum of 15% of the paper will assess learner's mathematical skills as applied within a design and technology context. Use of calculators is permitted in the written examination as outlined in Section 2c.

Iterative design challenge (02, 03) non-exam assessment (NEA)

The Iterative Design Challenge is a single task component, worth 100 marks and covering 50% of the qualification. The Iterative Design Challenge gives learners the opportunity to demonstrate their knowledge, understanding and skills over time in order to realise a valid outcome that reflects real-world design considerations. This component is internally assessed and externally moderated.

The content to be considered in the 'Iterative Design Challenge' is outlined in Section 2d.

Guidance on assessment, including the marking criteria is outlined in Section 3f.

Administration requirements for completing the NEA are outlined in Section 4d.

The following sub-headings give further clarity on the setting of the challenge, what is required by learners taking the challenge and an outline of the required evidence to support learner's challenges for assessment.

Setting of the challenge

Contextual challenges will be released by OCR on 1 June in the year prior to which the learner wishes to be awarded the qualification. OCR will release three open and real-world challenges at this time that are open for learners to interpret as they see fit.

A single challenge will need to be selected by the learner, offering an authentic starting point to explore and consider in relation to their subject interests and the problems and opportunities identified within the context.

This challenge is not defined by the materials or processes used to make a prototype, learners are also not required to connect the challenge directly to their in-depth learning for the written examination.

It is expected that the teacher will provide guidance to the learners in relation to the purpose and requirements of the task, ensuring that learners are clear about the assessment expectations and marking criteria they will be assessed against.

Prior learning and practical experience will be required in order that learners are able to demonstrate the knowledge, understanding and skills being assessed. Once the learners are working on their challenge any explanation or interpretation given by teachers must be general and not direct the learners own iterative design processes.

As part of the assessment of this component learners are required to write their own brief. General guidance is permitted to ensure learners undertake achievable projects, though teachers must not set any briefs or deliver specific guidance for their learners when writing their briefs.

Learners will have approximately 40 hours of lesson time in which to complete the NEA Iterative Design Challenge. This time is not a maximum or minimum requirement as all learners will have access to the 'contextual challenges' at the same given point. It should be noted that excessive time spent on this component could be detrimental to the level of the learner's work if it were to lose relevance and focus to the context and brief.

Further guidance about the nature of advice can be found in the *JCQ Instructions for conducting non-examined assessment.*

Taking the challenge

The 'Iterative Design Challenge' requires learners to pursue and manage iterations through the process of designing and making, exploring, creating and evaluating. Learners will identify requirements to be fulfilled and problems to solve throughout the iterative design process, which they should be encouraged to challenge as far as possible, learning through mistakes. Whilst undertaking their projects learners should make constant consideration of stakeholder needs, wants and interests. In doing so they should demonstrate:

- an ability to write at least one design brief
- an ability to identify and outline requirements through appropriate lists and specifications
- an ability to communicate their thinking through on-going dialogue
- their designing and making skills in order to work towards the development of a final prototype(s) based on their own design brief
- their ability to identify and solve problems even through failure of their own design intentions
- their applied knowledge and understanding of relevant design, making and technical principles
- their applied mathematical skills and scientific knowledge
- an ability to manage the 'next-steps' through many iterations when designing.

In order to complete their work, there are different levels of control, dependent on the work being undertaken. Throughout the challenge it is essential that the teacher can authenticate the learners work is their own.

Immediate guidance or supervision

When learners are producing their final prototype(s) this is required to be made under immediate guidance or supervision. The work should be securely stored within the centre throughout this part of the design and make process. Any support that is given to assist a learner should be recorded, whether this is direct assistance or due to health and safety requirements within the school. Where assistance has been given, marks should be deducted accordingly.

What teachers can do

Teachers may comment only on learners' work in progress and return it for redrafting. Once handed in for final assessment teachers may not return any work to candidates for further adjustment. Any feedback given by the teacher must be framed in such a way as to enable the learner to take the initiative in developing the work further.

What teachers cannot do

Teachers cannot give detailed advice and specific suggestions as to how the work may be improved in order to meet the marking criteria. This includes indicating errors or omissions and personally intervening to improve the content of the work. Provided that advice remains at the general level, there is no need to adjust learners assessment marks. Where intervention is required to support learners, this assistance must be recorded and marks deducted accordingly.

Both the teacher and learner should confirm the authentication of the learners' work using the CCS160 form as outlined in Section 4d.

Required evidence

There are **three** forms of evidence required to enable the consideration of each learner's level of attainment against the marking criteria, which is set out to differentiate between each learner's performance:

Portfolio of evidence

Learners should produce a chronological portfolio supported by real-time evidence that demonstrates their complete challenge. This evidence should clearly demonstrate the learner's design brief written in response to their chosen contextual challenge set by OCR. It should also be chronological, outlining iterations as they occur or are developed rather than as they may be best presented.

Portfolio evidence can be supported by video and audio recordings, but all evidence should be clearly labelled and signposted by the learner to ensure they are easily identifiable through both internal marking and external moderation, a clear list of content will help to support this.

Final Prototype

The final prototype(s) based on the learner's design brief should be clearly evidenced by the learner within their portfolio of evidence through the use photography and video as appropriate. All moving parts and perspectives should be appropriately visible to ensure it offers suitable evidence to any third party.

Observations

Teachers are best placed to evidence a learner's progress and the level of support given or independence demonstrated. Evidence of this nature can only be accepted in conjunction with the portfolio of evidence and final prototype(s).

Observed evidence is supporting evidence that should be recorded on the 'Candidate Record Form' and should reflect the wider evidence and support the internal marking.

3b. Assessment objectives (AO)

There are four Assessment Objectives in the OCR GCSE (9–1) in Design and Technology. These are detailed in the table below.

Learners are expected to demonstrate their ability to:

	Assessment Objective
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

The assessment objective relate directly to iterative processes of 'explore/create/evaluate' as follows: AO1 = Explore, AO2 = Create, AO3 = Evaluate.

AO weightings in OCR GCSE (9–1) Design and Technology

The relationship between the Assessment Objectives and the components are shown in the following table:

Component	% of overall GCSE (9–1) in Design and Technology (J310)			
	AO1	AO2	AO3	AO4
Principles of Design and Technology (J310/01)	0	0	10	40
Iterative Design Challenge (J310/02 or 03)	10	30	10	0
Total	10%	30%	20%	40%

3c. Assessment availability

There will be one examination series available each year in May/June to **all** learners.

The examined component must be taken in the same examination series as the non-exam assessment.

This specification will be certificated from the June 2019 examination series onwards.

3d. Retaking the qualification

Learners can retake the qualification as many times as they wish. They must retake all examined components of the qualification.

Learners can choose either to retake or to carry forward their mark for the non-exam component by using the carry forward entry option (see Section 4d).

3e. Assessment of extended response

The assessment materials for this qualification provide learners with the opportunity to demonstrate their ability to construct and develop a sustained line of reasoning which is coherent, relevant, substantiated and logically structured. Marks for extended responses are integrated into the marking schemes.

3f. Internal assessment of non-exam assessment (NEA)

There are different stages in the production of the non-exam assessment (NEA), the task setting, task taking and required evidence are outlined in Section 3a, this section outlines the marking and final submission of the centres entries.

Internal assessment

Marking should be positive, rewarding achievement rather than penalising failure or omissions. The awarding of marks must be directly related to the marking criteria.

Teachers should use their professional judgement to select the best-fit level descriptor that best describes the learners work, taking into consideration the general descriptor of that band in the process.

Teachers should use the full range of marks available to them and award all the marks in any level for which work fully meets that descriptor.

To select the most appropriate mark in the band descriptor, teachers should use the following guidance:

- where the learner's work *convincingly* meets the statement, the highest mark should be awarded
- where the learner's work a*dequately* meets the statement, the most appropriate mark in the middle of the range should be awarded
- where the learner's work *just* meets the statement, the lowest mark should be awarded.

There should be clear evidence that work has been attempted and some work produced. If a learner submits no work for a component then the learner should be indicated as being absent from that component. If a learner completes any work at all for the component then the work should be assessed according to the marking criteria and the appropriate mark awarded, which may be zero.

A portfolio will not be penalised for excessive pages as all work is completed within the same window of opportunity. However, any iterative design process should remain relevant to the contextual challenge. Teachers must clearly show how the marks have been awarded in relation to the marking criteria on the Candidate Record Form.

A combination of the following approaches to indicate how marks have been awarded should be adopted:

- be clear and unambiguous
- be appropriate to the aims and objectives of the work
- facilitate the standardisation of marking in the centre
- enable the moderator to check the application of the marking criteria to the marking.

There are 'Candidate Record Forms' for individual learners that can be found on Interchange. There is also one centre recording sheet for all learners.

Final submission

Work submitted for the GCSE level components should reflect the standard expected for a learner after a full GCSE (9−1) level course of study.

Centres must carry out internal standardisation to make sure that marks awarded by different teachers are accurate and consistent across all learners entered by the centre. To help set the standard of marking, centres should use exemplar material provided by OCR, and, where available, work from that centre from the previous year. Where work has been marked by more than one teacher in a centre, standardisation of marking should normally be carried out according to one of the following procedures:

- **either** a sample of work that has been marked by each teacher is re-marked by the teacher who is in charge of internal standardisation
- **or** all the teachers responsible for marking a component exchange some marked work (preferably at a meeting led by the teacher in charge of internal standardisation) and compare their marking standards.

Where standards are found to be inconsistent, the relevant teacher(s) should make adjustment to their marks or re-mark all learners' work for which they were responsible.

If centres are working together in a consortium they must carry out internal standardisation of marking across the consortium. Centres should retain evidence that internal standardisation has been carried out.

Once the final portfolio is submitted by the learner for assessment it must not be revised. Adding any material to the work or removing any material from it after it has been presented by a learner for final assessment would constitute malpractice. If a learner requires additional assistance in order to demonstrate aspects of the assessment, the teacher must submit a mark which represents the learner's unaided achievement.

Where the learners' evidence of their final prototype(s) is insufficient to demonstrate the marks that have been submitted by the centre, it is permitted for additional photography and or video evidence to support the marking. This evidence should remain separate from the learners work.

Each learner's work should be stored in a folder on a secure area on the centre's network. Prior to submitting the work to OCR, the centre should add the 'Candidate Record Form'.

For further guidance on e-portfolios and how to submit work refer to Section 4d. Work should be saved using the candidate name and centre name as reference.

Exams directory: www.ocr.org.uk

Iterative Design Challenge (02, 03) – Marking criteria

The marking criteria for the Iterative Design Challenge should be looked at alongside the non-exam content (NEA) in Section 2d in order to ensure coverage of content.

The following criteria is set out to ensure candidates are following a chronological iterative design process that reflects their thinking, creative and practical skills and abilities through designing and making a prototype(s).

The marking criteria are set out to clearly assess an iterative design process. The main emphasis of assessment therefore rewards the **process** of the 'Iterative Design Challenge' through explore/create/evaluate and the management of their interrelationship, evidenced through a candidate's chronological portfolio.

There will also be an assessment rewarding the quality of **outcomes**; both of the various design iterations and the final prototype(s) that are evidenced, this will be an assessment against the video and photographic evidence within the candidate's portfolio.

The marking criteria follow a 'best-fit' approach which is outlined in more detail earlier in this section. The layout is to support internal marking, using the statements and marks at the bottom of each strand to support 'best-fit' allocation.

When completing internal assessment, these marking criteria should be looked at alongside the administrative requirements of the NEA in Section 4d.

Assessment of process

The process strands of the marking criteria mirror an iterative design process with strands that cover ‘explore’, ‘create’ and ‘evaluate’. Effective management of the interrelationship between the strands of the iterative design process is assessed through the ‘manage’ strand, assessing the areas that hold together the connection of the process.

The evidence of the process will be given through the learner’s chronological portfolio. Further guidance on the collection and presentation of evidence can be found earlier in this section, in Section 3a and Section 4d.

Manage – (AO1, AO2, AO3)

Level 1 (1–4)	Level 2 (5–8)	Level 3 (9–12)	Level 4 (13–16)
• **Basic** design brief that is **limited** in relevance to the contextual challenge and outlines **few** stakeholder needs. • **Limited** specifications which are not always appropriate to the stage of development and give a **basic** outline of identified requirements. • **Basic** management of the challenge through **minimal** organisation and reflection that **limits** opportunities for identifying or resolving problems. • **Limited** review of progress resulting in **basic** or **superficial** judgements on the next-steps for future iterations of development.	• **Adequate** design brief that is relevant to the contextual challenge and outlines **some** stakeholder needs. • **Adequate** specifications **some** of which offer **some** appropriateness to the stage of development and **adequately** outline identified requirements. • **Adequate** management of the challenge through **some** organisation and reflection that **adequately** support problem solving and the realisation of opportunities. • **Adequate** review of progress resulting in **adequate** judgements on the next-steps for future iterations of development.	• **Well-thought-out** design brief that is relevant to the contextual challenge and outlines **most** stakeholder needs. • **Well-thought-out** specifications which are **mostly** appropriate to the stage of development and **competently** outline identified requirements. • **Good** management of the challenge through **competent** organisation and reflection that support problem solving and the realisation of opportunities. • **Well-informed** review of progress making **well-thought-out** judgements on the logical next-steps for future iterations of development.	• **Comprehensive** design brief that is relevant to the contextual challenge and **fully** outlines stakeholder Needs (AO1) • **Comprehensive** specifications which are **highy** appropriate to the stage of development and **thoroughly** outline identified requirements (AO1). • **Thorough** management of the challenge through systematic organisation and reflection that **fully** support problem solving and the realisation of opportunities (AO2). • **Comprehensive** review of progress making **effective** judgements on the logical next-steps for future iterations of development (AO3).
1 2 3 4	5 6 7 8	9 10 11 12	13 14 15 16

0 marks – No response or no response worthy of credit

Explore – (AO1)

Level 1 (1−3)	Level 2 (4−6)	Level 3 (7−9)	Level 4 (10−12)
• **Basic** investigation of the context, primary user and/or stakeholder needs and **limited** identification of design requirements, opportunities and/or constraints. • **Basic** investigation of existing products and/or design practices and **minimal** information gathered that has **minimal** influence on design iterations and thinking. • **Superficial** or **limited** consideration of materials and/or technical requirements that offer **limited** relevance to design iterations.	• **Adequate** investigation of the context, primary user and stakeholder needs and identification of **some** relevant and/or detailed design requirements, opportunities and constraints. • **Adequate** investigation of existing products and design practices and **some** information gathered that has **some** influence on design iterations and thinking. • **Adequate** consideration of **some** appropraite materials and technical requirements that are **adequately** explored and offer **some** relevance to design iterations.	• **Well-thought-out** investigation of the context, primary user and stakeholder needs and identification of **most** relevant and detailed design requirements, opportunities and constraints. • **Well-thought-out** investigation of existing products and design practices and **most** information gathered has **good** influence on design iterations and thinking. • **Well-though-out** consideration of most appropraite materials and technical requirements that are **competently** explored and offer relevance to design iterations.	• **Comprehensive** investigation of the context, primary user and stakeholder needs and identification of **fully** relevant and detailed design requirements, opportunities and constraints. • **Thorough** investigation of existing products and design practices and information gathered **comprehensively** and **fully** influences design iterations and thinking. • **Effective** consideration of appropriate materials and technical requirements that are **comprehensively** explored and offer **full** relevance to design iterations.
1 2 3	4 5 6	7 8 9	10 11 12

0 marks – No response or no response worthy of credit

Create – (AO2)

Level 1 (1−6)	Level 2 (7−12)	Level 3 (13−18)	Level 4 (19−24)
• **Limited** development of the challenge which shows **minimal** if any iterations and **limited** evidence of chronological progress. Real-time evidence may be **superficial**.	• **Adequate** development of the challenge which shows **some** iterations and **some** evidence of chronological progress. **Some** real-time evidence is given.	• **Well-thought-out** development of the challenge which shows a **good** progression of iterations and **good** evidence of chronological progress. **Good** real-time evidence given in support.	• **Thorough** development of the challenge which shows a **comprehensive** progression of iterations and **thorough** evidence of chronological progress. **Fully** supported by real-time evidence.
• **Basic** levels of thinking, **limited** problem solving and **minimal** demand that has **limited** reflection on feedback, offer relevance or focus.	• **Adequate** levels of thinking, problem solving and **some** demand that reflects on feedback and has **some** relevance and focus.	• **Competent** thinking, problem solving and **good** levels of demand that reflects on feedback and has **good** relevance, coherence and focus.	• **Comprehesive** thinking, problem solving and **effective** levels of demand that **fully** reflects on feedback and has **full** relevance, coherence and focus.
• **Limited** approaches to designing result in **minimal** imagination in the generation of design ideas that **superficially** reflect the purpose of the development and offer **basic,** predictable or stereotypical design solutions with **minimal** consideration of requirements of the user or wider stakeholders.	• **Adequate** approaches to designing result in **some** imagination in the generation of design ideas that **adequately** reflect the purpose of the development and offer **some** original design solutions with **some** consideration of requirements of the user and/or wider stakeholders throughout.	• **Well-thought-out** approaches to designing result in a **good** imaginaton in the generation of design ideas that **mostly** reflect the purpose of the development and offer **good** original or new design solutions with **well-informed** consideration of requirements of both the user and wider stakeholders throughout.	• **Comprehensive** approaches to designing result in an **excellent** imagination in the generation of design ideas that **effectively** reflect the purpose of the development and seek **fully** original or new design solutions with **comprehensive** consideration of requirements of both the user and wider stakeholders throughout.
• **Limited** experimentation, use of illustrative techniques, modelling and workshop skills that are not always appropriate to the stage of development and offer **limited** support to any design thinking.	• **Adequate** experimentation, use of illustrative techniques, modelling and workshop skills that offer **some** appropriateness to the stage of development to **adequately** inform design thinking.	• **Good** experimentation, use of illustrative techniques, modelling and workshop skills that are **mostly** appropriate to the stage of development to offer **well-informed**, ongoing design thinking.	• **Effective** experimentation, use of illustrative techniques, modelling and workshop skills that are **highy** appropriate to the stage of development to **fully** inform ongoing design thinking.
1 2 3 4 5 6	7 8 9 10 11 12	13 14 15 16 17 18	19 20 21 22 23 24

0 marks – No response or no response worthy of credit

Evaluate – (AO3)

Level 1 (1–4)	Level 2 (5–8)	Level 3 (9–12)	Level 4 (13–16)
• **Basic** analysis of stakeholder needs from primary and/or secondary sources. • **Basic** analysis of wider issues leading to **limited** evaluation or relevance to design iterations. • **Limited** evaluations of design solutions against identified stakeholder requirements, design opportunities and/or constraints are made infrequently and used to make **basic** or **superficial** judgements on future iterations. • **Limited** evaluation of feedback on their final prototype(s), **basic** or **superficial** suggestions for modification is made or **minimal** consideration of possible design optimisation.	• **Adequate** analysis of stakeholder needs from primary and secondary sources. • **Adequate** analysis of wider issues leading to **some** evaluation or relevance to design iterations. • **Adequate** evaluations of design solutions against identified stakeholder requirements, design opportunities and constraints are made with some regularity and used to make **adequate** judgements on future iterations. • **Adequate** evaluation of feedback on their final prototype(s), identifying **some** potential for further development, supported by **some** suggestions for modifications and/or consideration of possible design optimisation.	• **Well-informed** analysis of stakeholder needs from primary and secondary sources. • **Well-informed** analysis of wider issues leading to **well-thought-out** evaluation or relevance to design iterations. • **Well-thought-out** evaluations of design solutions against identified stakeholder requirements, design opportunities and constraints are made regularly and used to make **well-thought-out** judgements on future iterations. • **Well-thought-out** evaluation of feedback on their final prototype(s), identifying **good** potential for further development, supported by **good** suggestions for modifications and consideration of possible design optimisation.	• **Comprehensive** analysis of stakeholder needs from primary and secondary sources. • **Comprehensive** analysis of wider issues leading to **thorough** evaluation or relevance to design iterations. • **Thorough** evaluations of design solutions against identified stakeholder requirements, design opportunities and constraints are ongoing and used to make **effective** judgements on future iterations. • **Thorough** evaluation of feedback on their final prototype(s), identifying **full** potential for further development, supported by **comprehensive** suggestions for modifications and consideration of possible design optimisation.
1 2 3 4	5 6 7 8	9 10 11 12	13 14 15 16

0 marks – No response or no response worthy of credit

Assessment of outcomes

The outcome strands of the marking criteria are an opportunity to assess the actual design solutions, firstly the iteration designs, models and/or toiles then the final prototype(s). This is an assessment of the physical outcomes and the distinct designing and making skills that were demonstrated to deliver them.

The evidence of the outcomes will be given through photographs and videos of the iterative design solutions and final prototype(s). Further guidance on the collection and presentation of evidence can be found earlier in this section, in Section 3a and Section 4d.

Quality of design iterations – (AO2)

Level 1 (1–4)	Level 2 (5–8)	Level 3 (9–12)	Level 4 (13–16)
• Design iterations use **few** variations of formal or in-formal approaches and/or techniques when creating ideas and models which may not always be appropriate to the stage of development. • Design solutions are communicated through **basic** presentation, delivering **limited** evidence of creative thinking. • The quality of communication of design solutions is **limited** so a third party may find it difficult to fully understand desired intentions. • Illustrated technical information is **basic** and delivered with **limited** levels of detail and **limited** communication to a third party. Digital application may not be used.	• Design iterations use **some** variations of formal and/or in-formal approaches and techniques when creating ideas and models that offer **some** appropriateness to the stage of development. • Design solutions are communicated through **adequate** presentation, delivering **some** evidence of creative thinking. • The quality of communication of design solutions is **adequate** so a third party will have **some** clarity of desired intentions. • Illustrated technical infromation is **adequate** and delivered with **adequate** levels of detail that offer **adequate** communication to a third party.Some digital application is used.	• Design iterations use a **good** variety of formal and in-formal approaches and techniques when creating ideas and models that are **mostly** appropriate to the stage of development. • Design solutions are communicated through **good** presentation, delivering **good** evidence of creative thinking. • The quality of communication of design solutions is **good** so a third party will have clarity of **most** desired intentions. • Illustrated technical informtaion is **good** and delivered with **competent** levels of detail that offer **good** communicatins to a third party.. Digital applications are used.	• Design iterations use a **effective** variety of formal and in-formal approaches and techniques when creating ideas and models that are **highy** appropriate to the stage of development. • Design solutions are communicated through **effective** presentation, delivering **full** evidence of creative thinking. • The quality of communication of design solutions is **effective** so a third party will have **full** clarity of desired intentions. • Illustrated technical information is **thorough** and delivered with **thorough** levels of detail that offer **effective** communication to a third party. Digital applications are used.
1 2 3 4	5 6 7 8	9 10 11 12	13 14 15 16

0 marks – No response or no response worthy of credit

Quality of final prototype(s) – (AO2)

Level 1 (1–4)	Level 2 (5–8)	Level 3 (9–12)	Level 4 (13–16)
• The final prototype(s) is completed to a **basic** standard or is inncomplete, demonstrating **minimal** quality and **limited** levels of accuracy. • Making skills demonstrate **limited** levels of approach. • Use of hand tools, machinery and/or digital design and manufacture demosntrate **basic** skills. • The final prototype(s) is **limited in** meeting primary user and stakeholder requirements. It may not be fully functioning or finished to a high standard, demonstrating **minimal** potential to become a marketable product.	• The final prototype(s) is completed to an **adequate** standard, demonstrating **adequate** quality and **adequate** levels of accuracy. • Making skills demonstrate **some** openness and difficulty in approach. • Use of hand tools, machinery and/or digital design and manufacture demosntrate **adequate** skills. • The final prototype(s) **adequately** meets primary user and stakeholder requirements both functionally and/or aesthetically, demonstrating **some** potential to become a marketable product.	• The final prototype(s) is completed to a **good** standard, demonstrating **good** quality and **competent** levels of accuracy. • Making skills demonstrate **good** levels of complexity, openness and difficulty in approach. • Use of hand tools, machinery and digital design and manufacture demosntrate **competent** skills. • The final prototype(s) **competently** meets primary user and stakeholder requirements both functionally and aesthetically, demonstrating **good** potential to become a marketable product.	• The final prototype(s) is completed to a **high** standard, demonstrating **high** quality and **thorough** levels of accuracy. • Making skills demonstrate **high** levels of complexity, openness and difficulty in approach. • Use of hand tools, machinery and digital design and manufacture demosntrate a **high** level skill. • The final prototype(s) **effectively** meets primary user and stakeholder requirements both functionally and aesthetically, demonstrating **full** potential to become a marketable product.
1 2 3 4	**5 6 7 8**	**9 10 11 12**	**13 14 15 16**

0 marks – No response or no response worthy of credit

Iterative Design Challenge (02) – Assessment Objective distribution

The table below demonstrates how the Assessment Objectives are attributed to each strand of the marking criteria and where evidence of mathematics is assessed implicitly.

Strand of Marking Criteria	% of overall Iterative Design Challenge			Total % per strand	Use of Maths Skills
	AO1	AO2	AO3		
Manage	8	4	4	16	✔
Explore	12	0	0	12	✔
Create	0	24	0	24	✔
Evaluate	0	0	16	16	✔
Quality of design iterations	0	16	0	16	✔
Quality of final prototype(s)	0	16	0	16	✔
Total	**20%**	**60%**	**20%**	**100%**	

3g. Synoptic assessment

Synoptic assessment is the learners understanding of the connections between different elements of the subject. It involves the explicit drawing together of knowledge, skills and understanding from across the GCSE (9–1) course.

The emphasis of synoptic assessment is to encourage the understanding of Design and Technology as a whole discipline.

Synoptic assessment requires learners to make and use connections within and between all different areas of design and technology, for example, by:

- understanding how an iterative design process requires multiple considerations not only to 'explore/create/evaluate', but also through the application of knowledge and understanding of both 'core' and 'in-depth' designing, making and technical principles
- justifying thinking in relation to an iterative design process through the consideration of, say, the forces exerted on a joint or seam and what impact that has on the materials being used to demonstrate that it is effectively fulfilling its requirements, or the identification of stakeholder needs and fulfilling these needs through the delivery of a design solution
- stretching design challenges to not only demonstrate application of knowledge and understanding of design and technical principles, but also through the application of wider mathematical and scientific knowledge
- both components in this qualification contain an element of synoptic assessment.

3h. Calculating qualification results

A learner's overall qualification grade for the OCR GCSE (9–1) in Design and Technology will be calculated by adding together their marks from the two components taken to give their total weighted mark. This mark will then be compared to the qualification level grade boundaries for the entry option taken by the learner and for the relevant exam series to determine the learner's overall qualification grade.

4 Admin: what you need to know

The information in this section is designed to give an overview of the processes involved in administering this qualification so that you can speak to your exams officer. All of the following processes require you to submit something to OCR by a specific deadline.

More information about these processes, together with the deadlines, can be found in the OCR *Admin Guide and Entry Codes: 14–19 Qualifications*, which can be downloaded from the OCR website: www.ocr.org.uk

4a. Pre-assessment

Estimated entries

Estimated entries are your best projection of the number of learners who will be entered for a qualification in a particular series.

Estimated entries should be submitted to OCR by the specified deadline. They are free and do not commit your centre in any way.

Final entries

Final entries provide OCR with detailed data for each learner, showing each assessment to be taken. It is essential that you use the correct entry code, considering the relevant entry rules and ensuring that you choose the entry option for the moderation you intend to use.

Final entries must be submitted to OCR by the published deadlines or late entry fees will apply.

All learners taking a GCSE (9–1) in Design and Technology must be entered for one of the following entry options:

Entry option		Components		
Entry code	**Title**	**Code**	**Title**	**Assessment type**
J310 A	Design and Technology A	01	Principles of design and technology	External assessment
		02	Iterative Design Challenge (Repository)	Non-exam assessment
J310 B	Design and Technology B	01	Principles of design and technology	External assessment
		03	Iterative Design Challenge (Postal)	Non-exam assessment
J310 C	Design and Technology C*	01	Principles of design and technology	External assessment
		81	Iterative Design Challenge (Carried Forward)	Non-exam assessment

*Entry option J310 C should only be selected for learners who are retaking the qualification who want to carry forward their mark for the non-exam assessment.

4b. Special consideration

Special consideration is a post-assessment adjustment to marks or grades to reflect temporary injury, illness or other indisposition at the time the assessment was taken.
Detailed information about eligibility for special consideration can be found in the JCQ publication; *A guide to the special consideration process*.
Regulations governing examination arrangements are contained in the JCQ *Instructions for conducting examinations.*

4c. External assessment arrangements

Regulations governing examination arrangements are contained in the JCQ *Instructions for conducting examinations*.

4d. Admin of non-exam assessment

Regulations governing arrangements for internal assessments are contained in the JCQ *Instructions for conducting non-examination assessments*.

The contextual challenges that are set by OCR annually for this qualification will be posted on the subject page of the OCR website on the 1 June every year, from June 2018, for those learners that are entering for certification the following summer. The contextual challenges will not be posted to centres.

It should be made clear to learners that once the final portfolios have been submitted for assessment, no further work may take place.

Interpretation of 'challenge' tasks

The interpretation of any of the contextual challenges set by OCR forms an essential part of the learner's non-exam assessment. Prior teaching and learning should ensure learners know how to respond to a variety of contexts set in different ways. Learners should also be aware of how to modify their approach appropriately through an iterative design process, evidencing changes in the direction of a task is required.

Further information on task setting can be found in Section 3a.

Authentication of learners' work

Candidates and centres must declare that the work submitted for assessment is the candidate's own by completing a centre authentication form (CCS160) for the NEA. This information must be retained at the centre and be available on request to either OCR or the JCQ centre inspection service. It must be kept until the deadline has passed for centres to submit an enquiry about results (EAR). Once this deadline has passed and centres have not requested an EAR, this evidence can be destroyed.

A copy of the authentication form for each learner's work can be found on the OCR website www.ocr.org.uk. It is important to note that **all** learners are required to sign this form, and not merely those whose sample forms part of the sample submitted to the moderation.

Malpractice discovered prior to the learner signing the declaration of authentication does not need to be reported to OCR but must be dealt with in accordance with the centre's internal procedures.

Before any work towards the non-exam assessment is undertaken, the learner's attention should be drawn to the relevant JCQ Notice to Learners. This is available on the JCQ website www.jcq.org.uk and included in the *Instructions for Conducting Coursework/Portfolios*. More detailed guidance on the prevention of plagiarism is given in the *Plagiarism in Examinations.*

Learners' level of ability and each individual's work should be clearly identifiable and be taken under conditions which ensure that the evidence generated by each learner can be authenticated.

Investigation, exploration and design thinking can take place outside the centre as well as within the centre. Teachers need to ensure that the any work of this nature is only used to support the narrative of the NEA and that any work undertaken to present their final design solutions and prototypes is carried out under guidance and supervision.

When learners are producing their final prototype(s) this is required to be made under immediate guidance or supervision to ensure authenticity. The work should be securely stored within the centre throughout this part of the design and make process.

Head of centre annual declaration

The Head of Centre is required to provide a declaration to the JCQ as part of the annual NCN update, conducted in the autumn term, to confirm that all candidates at the centre have had the opportunity to undertake the prescribed activities for this course.

Please see the JCQ publication *Instructions for conducting non-examination assessments* for further information. Any failure by a centre to provide the Head of Centre Annual Declaration will result in your centre status being suspended and could lead to the withdrawal of our approval for you to operate as a centre.

Internal standardisation

Centres must carry out internal standardisation to ensure that marks awarded by different teachers are accurate and consistent across all learners entered for the component from that centre. This process is outlined further in Section 3f under 'Final Submission'.

Moderation

The purpose of moderation is to bring the marking of internally-assessed components in all participating centres to an agreed standard. This is achieved by checking a sample of each centre's marking of learner's work.

Following internal standardisation, centres submit marks to OCR and the moderator. If there are fewer than 10 learners, all the work should be submitted for moderation at the same time as marks are submitted.

Once marks have been submitted to OCR and your moderator, centres will receive a moderation sample request. Samples will include work from across the range of attainment of the learners' work.

There are two ways to submit a sample:

Moderation via the OCR Repository – Where you upload electronic copies of the work included in the sample to the OCR Repository and your moderator accesses the work from there.

Postal moderation – Where you post the sample of work to the moderator.

The method that will be used to submit the moderation sample must be specified when making entries. The relevant entry codes are given in Section 4a.

All learners' work must be submitted using the same entry option. It is not possible for centres to offer both options within the same series.

Centres will receive the outcome of moderation when the provisional results are issued. This will include:

Moderation Adjustments Report – Listing any scaling that has been applied to internally assessed components.

Moderator Report to Centres – A brief report by the moderator on the internal assessment of learners' work.

Preparing work for submission

Centres will be informed by OCR of the sample they are required to submit. Centres are responsible for the storage of candidates' folders within a secure folder on their centre network.

Within each learner's folder from the sample being submitted, the following forms should be included:

1. Authentication form (CCS160)
2. Candidate Record Form.

The Centre recording sheet (CRS1) should also be submitted with the sample. This is where all candidates' marks should be listed.

The Candidate Record Form is used to show supporting evidence for candidates' marks, offering an opportunity to justify marks and adding further evidence of the learner's prototype(s) if evidence was not sufficient.

All forms for submission are available to download on the subject page on the OCR website.

E-Portfolios

In order to minimise software and hardware compatibility issues it will be necessary to save learners' work using an appropriate file format.

Learners must use formats appropriate to the evidence they are providing and appropriate to viewing for assessment and moderation purposes.

Open file formats or proprietary formats for which a downloadable reader or player is available are acceptable. Where a downloadable version is not available, the file format is not acceptable.

Evidence submitted can be through one or more formats, but it is essential that all formats are clearly labelled and signposted to offer a straightforward chronological review of the work.

Learners do not gain marks for using more sophisticated formats or for using a range of formats. All portfolio evidence should be appropriate to the actual activity being pursued. So long as evidence is clearly 'real-time' a learner who chooses to use or only has access to digital photography (as required in the specification) and word documents will not be disadvantaged by that choice.

To ensure compatibility, all files submitted must be in the formats listed in Appendix 5f. Where new formats become available that might be accepted, OCR will provide further guidance on the subject webpage. OCR advises against changing the file format that the document was originally created in. It is the centre's responsibility to ensure that the electronic work submitted for moderation are accessible to the moderator and fully represent he evidence available for each learner.

Carrying forward non-exam assessment

Learners who are retaking the qualification can choose either to retake the non-exam assessment or to carry forward their mark for that component from the previous exam series.

If a learner decides to carry forward their mark, they must be entered in the retake series using the entry code for the carry forward option in Section 4a.

- Learners must decide at the point of entry whether they are going to carry forward the non-exam assessment, or if they are going to retake it to count towards their result. It is not possible for a learner to retake the non-exam assessment and then choose whether the retake result or a carried forward result is used for certification.
- Learners can only carry forward from one year into the following year. Where the gap between the initial qualification and the retake is more than one year, carry forward is not permitted.
- A result for a non-exam assessment component can only be carried forward once.

4e. Results and certificates

Grade Scale

GCSE (9–1) qualifications are graded on the scale: 9–1, where 9 is the highest. Learners who fail to reach the minimum standard of 1 will be Unclassified (U). Only subjects in which grades 9 to 1 are attained will be recorded on certificates.

Results

Results are released to centres and learners for information and to allow any queries to be resolved before certificates are issued.

Centres will have access to the following results' information for each learner:

- the grade for the qualification
- the raw mark for each component
- the total weighted mark for the qualification.

The following supporting information will be available:

- raw mark grade boundaries for each component
- weighted mark grade boundaries for each entry option.

Until certificates are issued, results are deemed to be provisional and may be subject to amendment.

A learner's final results will be recorded on an OCR certificate. The qualification title will be shown on the certificate as:

'OCR Level 1/2 GCSE (9–1) in Design and Technology'.

4f. Post-results services

A number of post-results services are available:

- **Enquiries about results** – If you are not happy with the outcome of a learner's results, centres may submit an enquiry about results.
- **Missing and incomplete results** – This service should be used if an individual subject result for a learner is missing, or the learner has been omitted entirely from the results supplied.
- **Access to scripts** – Centres can request access to marked scripts.

4g. Malpractice

Any breach of the regulations for the conduct of examinations and non-exam assessment may constitute malpractice (which includes maladministration) and must be reported to OCR as soon as it is detected.

Detailed information on malpractice can be found in the JCQ publication *Suspected Malpractice in Examinations and Assessments: Policies and Procedures*.

5 Appendices

5a. Accessibility

Reasonable adjustments and access arrangements allow learners with special educational needs, disabilities or temporary injuries to access the assessment and show what they know and can do, without changing the demands of the assessment. Applications for these should be made before the examination series. Detailed information about eligibility for access arrangements can be found in the JCQ *Access Arrangements and Reasonable Adjustments.*

The GCSE (9–1) qualification and subject criteria have been reviewed in order to identify any feature which could disadvantage learners who share a protected Characteristic as defined by the Equality Act 2010. All reasonable steps have been taken to minimise any such disadvantage.

5b. Overlap with other qualifications

This qualification allows for knowledge and understanding to be drawn on and applied from other qualifications such as GCSE (9–1) Art and Design, GCSE (9–1) Computer Science and GCSE (9–1) Geography, but there is no significant overlap with these qualifications.

There is content in the specification that has some overlap with GCSE (9–1) mathematics and scientific specifications. This overlap is a requirement of the qualification and in particular the mathematical skills are set out as a condition of assessment by Ofqual.

Within the content in Sections 2c and 2d of this specification the links to mathematics and science are highlighted using symbols.

 = Maths

 = Science

In addition the mathematical skills are interpreted for each component alongside the content and further mapping is given in the next two sections to outline the links to respective GCSE (9–1) specifications in Mathematics and Science.

In addition to the above the endorsed title of Textiles within GCSE (9–1) Art and Design can be seen to link directly to the textiles requirements in this qualification. It is however important to be aware that the two qualifications cover very different subjects. Candidates considering taking either qualification should be made aware of these differences to ensure they are making the right choices for their futures. A review of the progression to GCE Design and Technology: Fashion and Textiles will support centres in understanding the available pathways.

5c. Use of mathematics within Design and Technology

Through their work in design and technology learners are required to apply relevant mathematical knowledge, skills and understanding equivalent to Key Stage 3 learning.

The table below shows how the OCR interpretations for mathematical skills are used to cover the mathematical requirements for GCSE (9–1) Design and Technology. The interpretations show how the application of learning could be assessed in examinations and the applications that could be considered within non-exam assessment (NEA).

Within OCRs GCSE (9–1) in Mathematics the content is outlined at three different levels, the first identifying the initial learning required for the qualification which is equivalent to Key Stage 3 learning. This is shown in the table to support teaching and learning.

The final column outlines the required mathematical skills as given in the DfE Subject Criteria. This represents the full content required for assessment in GCSE (9–1) Design and Technology.

OCR Design and Technology specification ref.	Design and Technology interpretations from this specification	(E) Exam or (N) NEA	OCR GCSE (9–1) Mathematics ref.	GCSE (9–1) Mathematics specification (J560)	DfE GCSE Mathematics ref.	DfE Design and Technology ref.	Mathematical skills requirements for Design and Technology
1.	**Calculating quantities, cost and sizes of materials and design solutions**						
M1a	Understand the standard application of metric units (mm) used in design and technology and apply these appropriately using standard form (also be aware that some materials and components retain the use of imperial units).	**E, N**	**8.01f**	• Use a ruler to construct and measure straight lines.	**G2, G15**	**Intro** **1a**	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. Recognise and use expressions in decimal and standard form.
M1b	Calculate the surface area of triangular and rectangular materials and design solutions.	**E, N**	**10.03a** **10.03b**	• Know and apply the formula: $\text{area} = \frac{1}{2} \times \text{base} \times \text{height}$ • Know and apply the formula: $\text{area} = \text{base} \times \text{height}$	**G16, G17, G18, G23**	**1a** **1c** **4a** **4c**	Recognise and use expressions in decimal and standard form. Calculate surface area and volume. Use angular measures in degrees Calculate areas of triangles and rectangles, surface areas and volumes of cubes

OCR Design and Technology specification ref.	Design and Technology content from this specification	(E) Exam or (N) NEA	OCR GCSE (9–1) Mathematics ref.	GCSE (9–1) Mathematics specification (J560)	DfE GCSE Mathematics ref.	DfE Design and Technology ref.	Mathematical skills requirements for Design and Technology
M1c	Calculate the surface areas and volumes of cuboid within design solutions.	**E, N**	**10.03e** **10.04a**	• Apply area formulae in calculations involving the area of composite 2D shapes. • Calculate the surface area and volume of cuboids and other right prisms.		**1c** **4c**	Calculate surface area and volume. Calculate areas of triangles and rectangles, surface areas and volumes of cubes
M1d	calculate the quantities of materials used in their products considering tolerances as appropriate.	**E, N**	**10.01b** **4.01a**	• Use and convert simple compound units, including unit pricing. • Round answers to an appropriate level of accuracy.	**N13, N15, R1, R11, G14**	**1a**	Recognise and use expressions in decimal and standard form.
M1e	calculate the cost of materials used in their products considering percentage profit.	**E, N**	**2.03a** **2.03b**	• Convert between fractions, decimals and percentages. • Calculate a percentage of a quantity.	**R3, R6, R9**	**1b**	Use ratios, fractions and percentages.
M1f	Use standard units of mass, length, time, money and other measures using decimal quantities where appropriate using.	**E, N**	**10.01a**	• Use and convert standard units of measurement for length, area, volume/capacity, mass, time and money.	**N13, R1, G14**	**1a**	Recognise and use expressions in decimal and standard form.

OCR Design and Technology specification ref.	Design and Technology content from this specification	(E) Exam or (N) NEA	OCR GCSE (9–1) Mathematics ref.	GCSE (9–1) Mathematics specification (J560)	DfE GCSE Mathematics ref.	DfE Design and Technology ref.	Mathematical skills requirements for Design and Technology
2.	**Accuracy and resourcefulness**						
M2a	Understand and demonstrate application where appropriate of tessellated patterns to minimise waste.	**E, N**	**8.03d** **9.01a** **9.01b**	• Derive and use the sum of the interior angles of a triangle is 180°. • Derive and use the sum of the exterior angles of a polygon is 360°. • Find the sum of the interior angles of a polygon. • Find the interior angle of a regular polygon. • Reflect a simple shape. • Rotate a simple shape clockwise or anti-clockwise through a multiple of 90°.	**G3, G6, G7**	**4a**	Use angular measures in degrees
M2b	Understand the use of tolerance of measurements when developing design solutions into prototypes.	**E, N**	**4.01a**	• Round answers to an appropriate level of accuracy.	**N15**	**4a** **4b**	Use angular measures in degrees Visualise and represent 2D and 3D forms including two dimensional representations of 3D objects
M2c	Demonstrate accuracy in their measurements when marking out their practical work.	**N**	**8.01f**	• Use a ruler to construct and measure straight lines. • Use a protractor to construct and measure angles. • Use compasses to construct circles.	**G2, G15**	**4a** **4b**	Use angular measures in degrees Visualise and represent 2D and 3D forms including two dimensional representations of 3D objects

OCR Design and Technology specification ref.	Design and Technology content from this specification	(E) Exam or (N) NEA	OCR GCSE (9–1) Mathematics ref.	GCSE (9–1) Mathematics specification (J560)	DfE GCSE Mathematics ref.	DfE Design and Technology ref.	Mathematical skills requirements for Design and Technology
3.	**Presenting and interpreting drawings and models**						
M3a	Understand and use ratios to calculate the scaling of drawings and models.	**E, N**	**10.01c**	• Construct and interpret scale drawings.	**R2, G15**	**1b**	Use ratios, fractions and percentages.
M3b	Present accurate 2D and 3D graphics to communicate design solutions.	**E, N**	**8.04a** **8.04b** **8.06a**	• Know the basic properties of isosceles, equilateral and right angle triangles. • Know the basic properties of the square, rectangle, parallelogram, trapezium, kite and rhombus. • Recognise and know the properties of the cube, cuboid, prism, cylinder, pyramid, cone and sphere.	**G4, G6, G12**	**4b** **4c**	Visualise and represent 2D and 3D forms including two dimensional representations of 3D objects Calculate areas of triangles and rectangles, surface areas and volumes of cubes
M3c	Be able to interpret 3D drawings in order to draw 2D perspectives that can be used to communicate intentions and instructions to others.	**E, N**	**8.06b**	• Interpret plans and elevations of simple 3D solids.	**G1, G13**	**4b**	Visualise and represent 2D and 3D forms including two dimensional representations of 3D objects

OCR Design and Technology specification ref.	Design and Technology content from this specification	(E) Exam or (N) NEA	OCR GCSE (9–1) Mathematics ref.	GCSE (9–1) Mathematics specification (J560)	DfE GCSE Mathematics ref.	DfE Design and Technology ref.	Mathematical skills requirements for Design and Technology
4.	**Presenting and interpreting data**						
M4a	Use appropriate methods to present performance data, survey responses and information on design decision, including the use of frequency tables, graphs and bar charts.	**E, N**	**12.02a**	• Interpret and construct charts appropriate to the data type; including frequency tables, bar charts, pie charts and pictograms for categorical data, vertical line charts for ungrouped discrete numerical data. Interpret multiple and composite bar charts.	**S2**	**2a** **3a** **3b**	Presentation of data, diagrams, bar charts and histograms. Plot, draw and interpret appropriate graphs Translate information between graphical and numeric form
M4b	Understand and apply fractions and percentages when analysing data given in tables and charts.	**E, N**	**2.01a** **2.01c** **2.03a** **2.03b**	• Recognise and use equivalence between simple fractions and mixed numbers. • Calculate fraction of a quantity. • Convert between fractions, decimals and percentages. • Calculate a percentage of a quantity.	**N3, N12, R3, R6, R9**	**1b** **3a** **3b**	Use ratios, fractions and percentages. Plot, draw and interpret appropriate graphs Translate information between graphical and numeric form
M4c	Interpret and extract appropriate data from technical and graphical sources.	**E, N**	**12.02a** **12.03a**	• Interpret and construct charts appropriate to the data type; including frequency tables, bar charts, pie charts and pictograms for categorical data, vertical line charts for ungrouped discrete numerical data. Interpret multiple and composite bar charts. • Calculate the mean, mode, median and range. • Compare data sets using “like for Like” summary values.	**S2, S4, S5**	**3a** **3b**	Plot, draw and interpret appropriate graphs Translate information between graphical and numeric form

5d. Use of science within Design and Technology

Through their work in design and technology learners are required to apply relevant science knowledge and understanding equivalent to Key Stage 3 learning.

The table below shows how the OCR interpretations for science knowledge are used to cover the science requirements for GCSE (9–1) Design and Technology. The interpretations show how the application of learning could be assessed in examinations and the applications that could be considered within non-exam assessment (NEA).

Within OCRs GCSE (9–1) in Combined Science and GCSE (9–1) Computer Science the content outlines 'underlying knowledge and understanding' which is equivalent to the requirements of Key Stage 3 learning. This is shown in the table to support teaching and learning.

The final column outlines the required scientific knowledge as given in the DfE Subject Criteria. This represents the full content required for assessment in GCSE (9–1) Design and Technology.

OCR Science ref.	OCR Design and Technology specification ref.	Interpretations for application in Design and Technology	(E) Exam or (N) NEA	OCR GCSE (9–1) Combined Science ref.	GCSE (9–1) Combined Science A specification (J250) Or GCSE (9–1) Computer Science specification (J276)	DfE Links to science in Design and Technology ref.	Scientific knowledge and skills requirements for Design and Technology
1.	**Use of scientific vocabulary, terminology and definitions**						
S1a	**2d (1)** **2d (4)**	Appropriate use of scientific terms when developing a design brief and specifications.	**N**	**5d** **5e**	• Scientific quantities and corresponding units. • Apply skills in observation, modelling and problem-solving, with opportunities for these skills to be shown through links to specification content.	**1a**	Quantities, units and symbols.
S1b	**2c (7)** **2c (8)** **2d (7)** **2d (8)**	Calculation of quantities, measurement of materials and selection of components.	**E, N**	**5d** **5e** **P1.1**	• Scientific quantities and corresponding units. • Apply them in qualitative work and calculations. • Apply skills in observation, modelling and problem-solving, with opportunities for these skills to be shown through links to specification content. • Density is affected by the state materials are in.	**1b**	SI units (e.g. kg, g, mg; km, m, mm; kJ, J), prefixes and powers of ten for orders of magnitude (e.g. tera, giga, mega, kilo, centi, milli, micro and nano).

OCR Science ref.	OCR Design and Technology specification ref.	Interpretations for application in Design and Technology	(E) Exam or (N) NEA	OCR GCSE (9–1) Combined Science ref.	GCSE (9–1) Combined Science A specification (J250) Or GCSE (9–1) Computer Science specification (J276)	DfE Links to science in Design and Technology ref.	Scientific knowledge and skills requirements for Design and Technology
S1c	2c (5) 2d (5)	Classification of the types and properties of a range of materials.	E, N	5e C2.1 C3.1 C5.1 P1.1 P1.2	• Processes and methods of science and consideration of the different types of scientific enquiry. • Atomic model (Dalton). • Concept of pure substances. • Substances in terms of melting point, boiling point and chromatography will also have been met before • Conservation of mass, changes of state and chemical reactions. • Atomic model and atoms are examples of particles. They should also know the difference between atoms, molecules and compounds. • Density is affected by the state materials are in. • Matter and the similarities and differences between solids, liquids and gases. • Effect of temperature in the motion and spacing of particles and an understanding that energy can be stored internally by materials.	1c	Metals and non-metals and the differences between them, on the basis of their characteristic physical and chemical properties.
2.	**Lifecycle assessment and recycling**						
S2a	2c (3) 2c (5) 2d (3) 2d (5)	Selection of materials and components based on ethical factors, taking into consideration the ecological and social footprint of materials.	E, N	B6.1 C6.2	• Ecosystems and the various ways organisms interact. • Gases of the atmosphere from Key Stage 3. • Composition of the Earth, the structure of the Earth, the rock cycle, the carbon cycle, the composition of the atmosphere and the impact of human activity on the climate.	2a	The basic principles in carrying out a life-cycle assessment of a material or product.

OCR Science ref.	OCR Design and Technology specification ref.	Interpretations for application in Design and Technology	(E) Exam or (N) NEA	OCR GCSE (9–1) Combined Science ref.	GCSE (9–1) Combined Science A specification (J250) Or GCSE (9–1) Computer Science specification (J276)	DfE Links to science in Design and Technology ref.	Scientific knowledge and skills requirements for Design and Technology
3.	**Using materials and system components**						
S3a	**2c (5) 2c (7) 2d (5) 2d (7)**	Understanding of properties of materials and how they need to be protected from corrosion through surface treatments and finishes.	**E, N**	**C2.3** **C3.4** **P1.2**	• Difference between an atom, element and compound. • Ionic solutions and solids. • Effect of temperature in the motion and spacing of particles and an understanding that energy can be stored internally by materials.	**3a**	The conditions which cause corrosion and the process of corrosion and oxidisation.
S3b	**2c (5) 2d (5)**	Selecting appropriate materials.	**E, N**	**5e** **P1.2** **P2.3**	• Apply skills in observation, modelling and problem-solving, with opportunities for these skills to be shown through links to specification content. • Matter and the similarities and differences between solids, liquids and gases. • Forces acting to deform objects and to restrict motion.	**3b**	The composition of some important alloys in relation to their properties and uses.
S3c	**2c (5) 2c (7) 2d (5) 2d (7)**	Knowledge of properties of materials to be applied when designing and making.	**E, N**	**C6.1** **P2.3**	• Properties of ceramics, polymers and composites. • The method of using carbon to obtain metals from metal oxides. • Forces acting to deform objects and to restrict motion.	**3c**	The physical properties of [materials], how the properties of materials are selected related to their uses.

OCR Science ref.	OCR Design and Technology specification ref.	Interpretations for application in Design and Technology	(E) Exam or (N) NEA	OCR GCSE (9–1) Combined Science ref.	GCSE (9–1) Combined Science A specification (J250) Or GCSE (9–1) Computer Science specification (J276)	DfE Links to science in Design and Technology ref.	Scientific knowledge and skills requirements for Design and Technology
S3d	2c (3) 2d (3)	Understanding of how to choose appropriate energy sources.	E, N	B6.1	• Ecosystems and the various ways organisms interact. • Gases of the atmosphere.	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.
				C6.2	• Composition of the Earth, the structure of the Earth, the rock cycle, the carbon cycle, the composition of the atmosphere and the impact of human activity on the climate.		
				P4.1	• How waves behave and how the speed of a wave may change as it passes through different media. • How sound is heard and the hearing ranges of different species.		
				P4.2	• Uses of some types of radiation.		
				P5.1	• Energy listed as nine types. • Be able to approach systems in terms of energy transfers and stores. • That energy can be transferred in processes such as changing motion, burning fuels and in electrical circuits. • Idea of conservation of energy and that it has a quantity that can be calculated.		
				P5.2	• Transfer of energy into useful and waste energies. • Power and how domestic appliances can be compared. • Insulators and how energy transfer is influenced by temperature. • Ways to reduce heat loss in the home.		
				P6.2	• Renewable and non-renewable energy resources. • Basic understanding of how power stations work and the cost of electricity in the home. • Electrical safety features in the home.		

OCR Science ref.	OCR Design and Technology specification ref.	Interpretations for application in Design and Technology	(E) Exam or (N) NEA	OCR GCSE (9–1) Combined Science ref.	GCSE (9–1) Combined Science A specification (J250) Or GCSE (9–1) Computer Science specification (J276)	DfE Links to science in Design and Technology ref.	Scientific knowledge and skills requirements for Design and Technology
S3e	**2c (6)** **2d (6)**	Knowledge of the function of mechanical devices to produce different sorts of movement, changing the magnitude and direction of forces.	**E, N**	**P2.1** **P2.2** **P2.3**	• Relationship between speed, distance and time. • Represent information in a distance-time graph. • Relative motion of objects. • Contact and non-contact forces influencing the motion of an object. • Newtons and that this is the measure of force. • Force arrows and have an understanding of balanced and unbalanced forces. • Forces acting to deform objects and to restrict motion. • Hooke's law and the idea that when work is done by a force it results in an energy transfer and leads to energy being stored by an object. • There is a force due to gravity and that gravitational field strength differs on other planets and stars.	**3e**	The action of forces and how levers and gears transmit and transform the effects of forces.

OCR Science ref.	OCR Design and Technology specification ref.	Interpretations for application in Design and Technology	(E) Exam or (N) NEA	OCR GCSE (9–1) Combined Science ref.	GCSE (9–1) Combined Science A specification (J250) Or GCSE (9–1) Computer Science specification (J276)	DfE Links to science in Design and Technology ref.	Scientific knowledge and skills requirements for Design and Technology
S3f	**2c (6) 2d (6)**	Knowledge of electronic systems through an understanding of currents (I), resistance (R) and potential difference (V); explain the design and use of circuits – including for lamps, diodes, thermistors and LDRs. Calculate the currents, potential differences and resistances in DC series circuits; represent them with the conventions of positive and negative terminals, and the symbols that represent common circuit elements, including diodes, LDRs and thermistors.	**E, N**	**P3.1** **P3.2** **P3.3** **P5.1** **P5.2**	• Electron transfer leading to objects becoming statically charged and the forces between them. • Existence of an electric field. • Measurement of conventional current and potential difference in circuits. • Assemble series and parallel circuits and of how they differ with respect to conventional current and potential difference. • Current and resistance and the units in which they are measured. • Magnets and the idea of attractive and repulsive forces. • Shape of the fields around bar magnets. • Magnetic effect of a current and electromagnets. • Energy transfer in process of electrical circuits. • Conservation of energy and that it has a quantity that can be calculated. • Transfer of energy into useful and waste energies. • Power and how domestic appliances can be compared. • Insulators and how energy transfer is influenced by temperature.		

5e. Glossary of terms from the specification content

Circular economy	A circular economy is an alternative to a traditional linear economy (make, use, dispose) in which we keep resources in use for as long as possible, extract the maximum value from them whilst in use, then recover and regenerate products and materials at the end of each service life. It aims to keep products, components and materials at their highest utility and value at all times.
Context	Circumstances that form a setting, surroundings, people, places, events that all form a setting for us to design within.
Creativity	Creativity is a phenomenon whereby something new and valuable is formed. The ability to transcend traditional ideas, rules, patterns, relationships, or the like, and to create meaningful new ideas, forms, methods, interpretations, etc. originality, progressiveness, or imagination.
Critique	Critique is a method of disciplined, systematic analysis of a written or oral discourse. Although critique is commonly understood as fault finding and negative judgment, it can also involve merit recognition, and in the philosophical tradition it also means a methodical practice of doubt. Its detailed evaluation.
Design optimisation	Product design and development requires that engineers consider trade-offs between product attributes in the areas of cost, weight, manufacturability, quality, and performance. It's about determining how to arrive at the best overall design, making the right compromises, and not sacrificing critical attributes like safety.
Design solution	A design solution is a generic term that can be used to outline any existing products or systems, or any design development that is offered as an answer to needs, wants and requirements. This can be a fully drawn up solution, a prototype or an existing product.
Digital design	Digital design is the use of computers, graphics tablets and other electronic devices to create graphics and designs for the web, television, print and portable electronic devices. Digital designers use creativity and computer skills to design visuals associated with electronic technology.
Disruptive technologies	Disruptive technology is a new emerging technology that unexpectedly displaces an established one. Recent examples of disruptive technologies include smart phones and e-commerce retailing. Clayton Christensen popularised the idea of disruptive technologies in the book "The Innovator's Dilemma" in 1997.
Disassembly	To disconnect the pieces of (something), to take things apart into smaller pieces. Used within Design and Technology to analyse and test products.
Ecological footprint	Ecological footprint is a measure human impact through supply and demand on nature. It represents the productive area required to provide renewable resources that humanity is using and to absorb its waste.

Enterprise	Relating to a progressive approach that demonstrates initiative, resourcefulness and willingness to undertake new and challenging projects.
Fixation	The state of being unable to stop thinking about something, or an unnaturally strong interest in something. We talk about this in terms of design fixation, i.e. being fixated with an idea.
Global sustainable development	sustainable development relates to the principle of sustaining finite resources that are necessary to provide for the needs of future generations of life on the planet.
Innovation	Innovation in the context of this qualification refers to students considering new methods or ideas to improve and refine their design solutions and meet the needs of their intended market and/or primary user.
Iterative design	Iterative design is a design methodology based on a cyclic process of prototyping, testing, analysing, and refining a product or process. Within the context of this specification we refine these processes to explore/create/evaluate. In iterative design, interaction with the product or system is used as a form of investigation for informing and evolving a project. Based on the results of testing the most recent iteration of a design, changes and refinements are made.
Just in time (JIT)	Just-in-time (JIT) manufacturing, also known as just-in-time production or the Toyota production system (TPS,) is a methodology aimed primarily at reducing flow times within production as well as response times from suppliers and to customers. A strategy companies employ to increase efficiency and decrease waste by receiving goods only as they are needed in the production process, thereby reducing inventory costs.
Lean manufacturing	Lean manufacturing or lean production, often simply “lean”, is a systematic method for the elimination of waste within a manufacturing system.
Life cycle assessment (LCA)	Life-cycle assessment (LCA), also known as life-cycle analysis, eco-balance, and cradle-to-grave analysis is a technique to assess environmental impacts associated with all the stages of a product’s life from cradle to grave (from raw material extraction through materials processing, manufacture, distribution, use during its life, repair and maintenance, and end of life disposal or recycling).
Needs	A need is a thing that is necessary for someone to live a healthy, safe and life. A need can imply a want, a lack, or a demand, which must be filled.
Ongoing dialogue	An exchange of ideas or opinions on a particular issue, with a view to reaching an amicable agreement or settlement.
Practical activities	Practical activities enable the student to put into practice the theory and/or skills they are studying, in a practical environment. This will involve all stages of designing and making, but also investigative, testing and analytical activities.

Primary user	The primary user is that person our group of people that are intended to practically use a product or system in their lives. Many products may have primary users that use the same product in different ways or with different purpose.
Prototypes	In the context of this qualification, the term 'prototype' refers to a functioning design outcome. A final prototype could be a highly finished product, made as proof of concept prior to manufacture, or a working scale models of a system where a full-size product would be impractical.
Real-time evidence	Evidence that demonstrates activity as it happens through whatever medium it is recorded in. Real-time evidence is gathered to support the chronological delivery of a portfolio.
Requirements	In product development a requirement is a singular physical and functional need that a particular design, product or process must be able to perform. It is a statement that identifies a necessary attribute, capability, characteristic, or quality of a system for it to have value to a customer, user, or other stakeholder.
Sketch modelling	Sketch modelling enables you to study, visualise and understand the space in 3D because it looks more real than pen and paper sketches. It can involve modelling using cheap materials and help you work out your design ideas or sketching of parts to explore the parts of a design.
Social footprint	Social footprint is linked to the carbon footprint, implying that all human actions leave a trace, and sometimes our lifestyle choices have negative consequences on the environment.
Solutions	A solution is a way to solve a problem or resolve a bad situation.
Stakeholders	A stakeholder is a person, group or organisation with an interest in a project; for example, parents/schools when designing products for children; the manufacturer or retailer that has an interest in a product; a regulator who needs to ensure products meet required regulations within a jurisdiction; when acting as a designer, the stakeholder that you are working for would be defined as a client.
Systems thinking	'Systems thinking' is a holistic approach to analysis that focuses on the way that a system's constituent parts interrelate and how systems work over time and within the context of larger systems.
Upcycling	Upcycling, also known as creative reuse, is the process of transforming by-products, waste materials, useless and/or unwanted products into new materials or products of better quality or for better environmental value.
User-centred design	User-centred design (UCD) is a framework of processes (not restricted to interfaces or technologies) in which the needs, wants, and limitations of end users of a product, service or process are given extensive attention at stage of the design process.

5f. Accepted file formats

Further explanation of the use of formats for non-exam assessment can be found in Section 4d under 'E-portfolios'

Movie formats for digital video evidence
MPEG (*.mpg)
QuickTime movie (*.mov)
Macromedia Shockwave (*.aam)
Macromedia Shockwave (*.dcr)
Flash (*.swf)
Windows Media File (*.wmf)
MPEG Video Layer 4 (*.mp4)

Audio or sound formats
MPEG Audio Layer 3 (*.mp3)

Graphics formats including:
JPEG (*.jpg)
Graphics file (*.pcx)
MS bitmap (*.bmp)
GIF images (*.gif)

Animation formats
Macromedia Flash (*.fla)

Text formats
Comma Separated Values (.csv)
PDF (.pdf)
Rich text format (.rtf)
Text document (.txt)

Microsoft Office suite
PowerPoint (.ppt) (.pptx)
Word (.doc) (.docx)
Excel (.xls) (.xlsx)
Visio (.vsd) (.vsdx)
Project (.mpp) (.mppx)

5g. Acknowledgements

Designing Our Tomorrow

In developing this specification, we have consulted and drawn on the research and authentic practices of an initiative called Designing Our Tomorrow, from the University of Cambridge. In particular, the content and Figures related to the iterative processes, from, namely, Explore: Create: Evaluate: Manage, used throughout this specification and shown schematically in Fig. 1, Fig. 2 and Fig. 3.

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