GCE AS/A LEVEL

WJEC GCE AS/A Level in

DESIGN AND TECHNOLOGY

APPROVED BY QUALIFICATIONS WALES

GUIDANCE FOR TEACHING

Teaching from 2017

This Qualifications Wales regulated qualification is not available to centres in England.

Contents

Introduction

The WJEC GCE Design and Technology specification can be delivered and assessed in centres in Wales, schools and colleges in independent regions such as the Isle of Man and the Channel Islands. This specification meets the Approval Criteria for GCE AS and A level Qualifications which set out the requirements for all new or revised GCE specifications developed to be taught in Wales from September 2017. Additionally, the specification meets the requirements of the Approval Criteria for GCE AS and A level Design and Technology (July 2016). WJEC has worked closely with teachers and outside organisations in developing this qualification.

This guidance for teaching publication is one of a number of ways in which WJEC provides assistance to teachers delivering this specification. This guide is to be used in conjunction with, and as a supplement to the Specification and Sample Assessment Materials (question papers and marking schemes). It is not intended as, and cannot be used as, a replacement for either of these essential materials.

Other provision which you may find useful:

- easy access to the specification and other key documents on the WJEC website
- CPD advice available via the WJEC website
- face to face CPD at a range of venues across Wales
- additional, free-to-access, digital resources
- easy access, by telephone or email, to both the Subject Officer and Subject Support Officer for GCE Design and Technology
- opportunities to become an examiner or moderator for the new specification
- visiting moderation

Contact points for WJEC GCE in GCE Design and Technology are as follows:

Stephen Howells steve.howells@wjec.co.uk 029 2026 5017 (Subject Officer)
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Subject page: http://www.wjec.co.uk/qualifications/design-and-technology/r-design-and-technology-gce-2017/

Continuing Professional Development

CPD will be delivered to assist in explaining the WJEC GCE in Design and Technology qualification. WJEC will continue to deliver CPD in Wales for the life of the qualification.

Please use the following link to search for CPD events and make bookings:

http://www.wjec.co.uk/cpd/

Prohibited combinations

Learners will only be allowed to study **one** of the three endorsed titles on offer.

Aims and objectives

This WJEC specification in GCE Design and Technology provides opportunities for learners to follow a course that is, inspiring, rigorous coherent and balanced. The learners will be expected to be creative, innovative and solve problems that they have realised themselves. It is essential that they use the iterative design process in designing and making real products that solve real problems.

The specification will enable learners to:

- be open to taking design risks, showing innovation and enterprise whilst considering their role as responsible designers and citizens, develop intellectual curiosity about the design and manufacture of products and systems, and their impact on daily life and the wider world
- work collaboratively to develop and refine their ideas, responding to feedback from users, peers and expert practitioners
- gain an insight into the creative, engineering and/or manufacturing industries
- develop the capacity to think creatively, innovatively and critically through focused research and the exploration of design opportunities arising from the needs, wants and values of users and clients
- develop knowledge and experience of real world contexts for design and technological activity
- develop an in-depth knowledge and understanding of materials, components and processes associated with the creation of products that can be tested and evaluated in use
- be able to make informed design decisions through an in-depth understanding of the management and development of taking a design through to a prototype/product
- be able to create and analyse a design concept and use a range of skills and knowledge from other subject areas, including mathematics and science, to inform decisions in design and the application or development of technology
- be able to work safely and skilfully to produce high-quality prototypes
- have a critical understanding of the wider influences on design and technology, including cultural, economic, environmental, historical and social factors
- develop the ability to draw on and apply a range of skills and knowledge from other subject areas, including the use of mathematics and science for analysis and informing decisions in design.

Prior learning and progression

There are no previous learning requirements for this specification. Any requirements set for entry to a course based on this specification are at the school/college's discretion.

This specification builds on the knowledge, understanding and skills established at GCSE.

This specification provides a suitable foundation for the study of design and technology or a related area through a range of higher education courses, progression to the next level of vocational qualifications or employment. In addition, the specification provides a coherent, satisfying and worthwhile course of study for learners who do not progress to further study in this subject.

Welsh Baccalaureate

In following this specification, learners should be given opportunities, where appropriate, to develop the skills that are being assessed through the Skills Challenge Certificate of the Welsh Baccalaureate Certificate:

- Literacy
- Numeracy
- Digital Literacy
- Critical Thinking and Problem Solving
- Planning and Organisation
- Creativity and Innovation
- Personal Effectiveness

Welsh perspective

In following this specification, learners should be given opportunities, where appropriate, to consider a Welsh perspective if the opportunity arises naturally from the subject matter and if its inclusion would enrich learners' understanding of the world around them as citizens of Wales as well as the UK, Europe and the world.

The specifications at a glance

Learners will follow one endorsed route through the specification Engineering Design or Fashion and Textiles or Product Design. Each specification is split into core technical, in-depth technical and core designing and making.

AS level course is made up of two units:

Unit 1 - Written paper

Unit 2 - Design and make task – approximately 40 hours

A level course is made up of four units:

Unit 1 - Written paper

Unit 2 - Design and make task

Unit 3 - Written paper

Core technical principles	In-depth technical
• 2.1 AS and A level • 2.2 A level only	• engineering design 2.3.1 AS and A level 2.3.2 A level only • fashion and textiles 2.3.3 AS and A level 2.3.4 A level only • product design 2.3.5 AS and A level 2.3.6 A level only
Core designing and making principles – NEA (Non examination assessment)	
• 2.4 AS and A level • 2.5 A level only	

Unit 4 - Design and make task – approximately 60 hours

Endorsed route	Level	Content
Engineering design	AS	2.1 + 2.3.1 + 2.4
	A	2.1 + 2.2 + 2.3.1 + 2.3.2 + 2.4 +2.5
Fashion and textiles	AS	2.1 + 2.3.3 + 2.4
	A	2.1 + 2.2 + 2.3.3 + 2.3.4 + 2.4 +2.5
Product design	AS	2.1 + 2.3.5 + 2.4
	A	2.1 + 2.2 + 2.3.5 + 2.3.6 + 2.4 +2.5

Exemplar – extracts from parts of the specification

2.1 Core technical principles (AS and A level)

The following technical principles apply to all endorsed areas

Content	Amplification
How manufactured products typically involve multiple materials, processes and techniques and that designers need to be able to discriminate between them and select them appropriately for use, experimenting in order to improve, refine and realise a design	The complexity and inter-relationship between parts/components/materials in a manufactured product Selection of materials and components based on defined criteria such as price and performance Investigation, team work (including brainstorming), research, modelling, prototyping and trialling The process of innovation - collaborative and commercial approaches; the development of innovative product solutions (solutions showing innovative use of materials **etc.**

2.2 Core technical principles (A level)

Content	Amplification
The main features of manufacturing industries, including stages of production, quality assurance and quality control, modern manufacturing methods and systems when combining or processing materials, sustainability, and services to the customer including legal requirements	Principles of industrial manufacturing systems across a range of scales of production to include mass, batch, one-off Staffing needs, allocation of costs, JIT manufacture and commercial liability Bought-in, standardised part assembly, sub-contracting The use of different levels of production taking into account economic decisions Unit /one-off (including prototyping) **etc.**

The following technical principles apply to all endorsed areas:

2.4 Core design and making principles (AS and A level)

The following design and making principles apply to all endorsed areas

Content	Amplification
User-centred design: the investigation and analysis of a problem within a context, and the needs, wants and values of users, to define a design opportunity or problem leading to the production of a design brief and specification to direct, inform and evaluate their design practice	User centred design including means of obtaining views and analysing feedback, the investigation and analysis of a problem, the needs wants and **etc.**

The basics **AS Level:**

Unit 1 - Written paper	Unit 2 - Design and make task- NEA
40%	40%
• Focus area specific examination • No sections • Learners attempt all questions • A mix of short answer structured and extended writing questions • A design question	• Started in the first year of the course • Design and make task that should be equivalent to approximately 40 hours work • The design work should start with the learner's own challenges • Recommend that the work is done both in school and at home, under the guidance of the teacher • Design sketch books plus a design portfolio.

The basics **A Level:**

Unit - 3	Unit 4 - Design and make task - NEA
60%	60%
• Focus area specific examination • No sections • Learners attempt all questions • A mix of short answer structured and extended writing questions • Questions can come from any part of the specification - core or in-depth knowledge and understanding, core or in-depth design and make	• It can be started after the AS examination year of the course • Design and make task that should be equivalent to approximately 60 hours work • The design work should start with the leaner's own challenges • Recommend that the work is done both in school and at home, under the guidance of the teacher • Design sketch books plus a design portfolio.

Course overview

GCE Design and Technology: Engineering Design, Fashion and Textiles and Product Design

Unit 1 – Written paper – Engineering Design

Written Examination: 2 hours

80 marks in total

There are no optional questions in the examinations. Learners are expected to attempt all questions. Learners will write their responses in the space provided underneath each question. The lined space provided is intended to give learners ample space to record their responses. There is no expectation that learners will fill up all the space provided. Extra lined pages are provided within the question paper, and further continuation booklets will be provided for learners if necessary.

Typical question

(a) Describe two ways in which the development of computer aided design (CAD) has been beneficial to the designer. [2]

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The answers must demonstrate an understanding of CAD and two descriptions are required to achieve the full two marks.

CAD drawings can be stored electronically and sent by email. ***1 mark***

CAD can save a considerable amount of space through electronic storage and proposals can be sent electronically in order to reduce lead in times.
2 marks

(b) Explain how computer numerical control (CNC) machines influence high volume production. [2]

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The key words in the questions are explain, CNC and high volume production. The question is asking for a developed explanation.

Using CNC machines can improve consistency and parts can be produced quickly. ***1mark***

Using CNC machines can improve consistency as human error can be eliminated. Complex parts can be quickly produced in large quantities at reduced cost. ***2 marks***

(c) Discuss the impact of:

(i) rapid prototyping on product development; [2]

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(ii) digital processing on product development. [2]

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*Answers that demonstrate an understanding of rapid prototyping and digital processing should be awarded up to **2** marks*

Two marks for each part (i) and part (ii) if an appropriate response is fully evaluated.

(i) *Rapid prototyping can speed up product development and give clients the opportunity to provide feedback about the product.* ***1 mark***

Rapid prototyping can speed up product development as an accurate prototype can be produced very quickly from a CAD drawing, giving potential clients the opportunity to visualise the product and to provide feedback so that modifications can be made prior to production. ***2 marks***

(ii) *Digital processing allows ideas to be shared by designers working in different parts of the world.* ***1 mark***

Digital processing enables ideas to be shared quickly with others on a global basis so that proposed modifications can be made and sent by return. The time taken between the development of initial ideas and manufacture is significantly reduced. ***2 marks***

Typical question

The image below of is of a traditional mountain bike.

MaxPixel Public Domain http://bit.ly/2GvC7uG

The bike frame structure illustrated is subjected to both static and dynamic forces.

Evaluate how the traditional mountain bike has been designed in order to withstand the impact of these static and dynamic forces. [8]

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Evaluate is seen as more demanding style of question and the response is expected to be in an essay style. Candidates are required to appraise and/or make judgements about how the bike has been designed to withstand static and dynamic forces.

Answers that demonstrate an understanding of static and dynamic forces should be awarded up to 8 marks based on:

Forces acting on the structure include tension, compression, torsion and shear. A full response would need to give consideration as to how the different parts of the bicycle have been designed to withstand these forces. This could include reference to triangulation in the frame and an understanding that different parts can act as either struts or ties as the dynamic forces change. In order to ensure against structural failure a factor of safety must also be applied to the design, candidates may also make reference to stress analysis and factors related to fatigue and creep.

- *Little or no understanding* ***0 marks***
- *Basic appraisal and/or judgements of how bike withstands either static or dynamic forces* ***1-2 marks***
- *Satisfactory appraisal and/or judgements of how bike withstands either static or dynamic forces* ***3-4 marks***
- *Good appraisal and/or judgements of how bike withstands both static and dynamic forces* ***5-6 marks***
- *Very good appraisal and/or judgements of how bike withstands both static and dynamic forces* ***7-8 marks***

The iterative design based question

The aim of the design question is to:

- test real knowledge and understanding across the whole of AS specification;
- the learner's ability to apply the iterative process of designing.

Note: The iterative design based question will not be the same each year and it is essential for learners to be aware that the format and style will change.

The answer may include sketches to support answers given. Communication by sketching in 2D, 3D, sections with annotation and notes to explain the learner's responses are tested here. The question could focus on any part of the Iterative Design Process testing the learner's ability to apply the iterative process of designing and knowledge and understanding across the specification.

Unit 1 –Design and Technology in the 21st Century – Fashion and Textiles

Written Examination: 2 hours

80 marks in total

Typical question

Advances in CAD/CAM technology have given rise to alternative methods of designing and manufacturing fashion and textile products. The product shown below has been made using a laser cutter.

(a) Explain one advantage of a laser cutter when designing and making textile products like the one shown. [2]

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The question is specifically looking for one advantage of a laser cutter and is worth 2 marks. Marks will be awarded one for a correct advantage and one mark for a correct explanation.

(b) Describe the limitations associated with the use of a laser cutter when making textile products. [2]

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The question is specifically looking for a description of the limitations of the laser cutter and is worth 2 marks. The written answer must be a developed response and not just simply 'certain textiles will burn'.

(c) The world of textile printing is rapidly changing. The dress below has been digitally printed.

Discuss the benefits of digital textile printing for the designer. [4]

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Answers should explain the benefits of digital textile printing to the designer. Responses should also be justified with a reason as to why it is a benefit.

A basic response, limited understanding of the benefits of using a digital printer: One of the biggest benefits digital printing provides is the reduction of downtime.

1 mark

Some understanding with slightly more detail, a basic understanding of the benefits of using a digital printer: One of the biggest benefits digital printing provides is the reduction of downtime. This is due to the fact that lengthy setup and clean up between patterns is not required.

2 marks

A good response: a good understanding of the benefits of using a digital printer: One of the biggest benefits digital printing provides is the reduction of downtime. This is due to the fact that lengthy setup and clean up between patterns is not required. This means that in theory digital patterns can be

printed 24 hours a day.

3 marks

A full and detailed response: a detailed and full understanding of the benefits of using a digital printer. One of the biggest benefits digital printing provides is the reduction of downtime. This is due to the fact that lengthy setup and clean up between patterns is not required. This means that in theory patterns can be printed 24 hours a day. In addition to increased efficiency, digital printing allows designers to make any pattern and colour changes immediately.

4 marks

Typical question

The rucksack shown below is made from a plain weave fabric using polyamide fibres.

(a) Explain the reasons why the plain weave polyamide fabric is suitable for a rucksack. [4]

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The answer must show a detailed understanding of the contribution made by several aspects of the polyamide fibre content and plain weave structure. Information must be relevant, accurate and clearly related to the end use of the fabric.

(b) Explain two ways the functionality of the bag could be improved. [4]

Explanation 1: .....

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..... [2]

Explanation 2: .....

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..... [2]

The answer must be detailed and relate how the functionality could be improved. The explanations must be detailed and related directly to the product. A simple answer such as add pocket would achieve no marks.

The iterative design based question

The aim of the design question is to:

- test real knowledge and understanding across the whole of AS specification;
- the learner's ability to apply the iterative process of designing.

Note: The iterative design based question will not be the same each year and it is essential for learners to be aware that the format and style will change.

The answer may include sketches to support answers given. Communication by sketching in 2D, 3D, sections with annotation and notes to explain the learner's responses are tested here. The question could focus on any part of the Iterative Design Process testing the learner's ability to apply the iterative process of designing and knowledge and understanding across the specification.

Unit 1 –Design and Technology in the 21st Century – Product Design

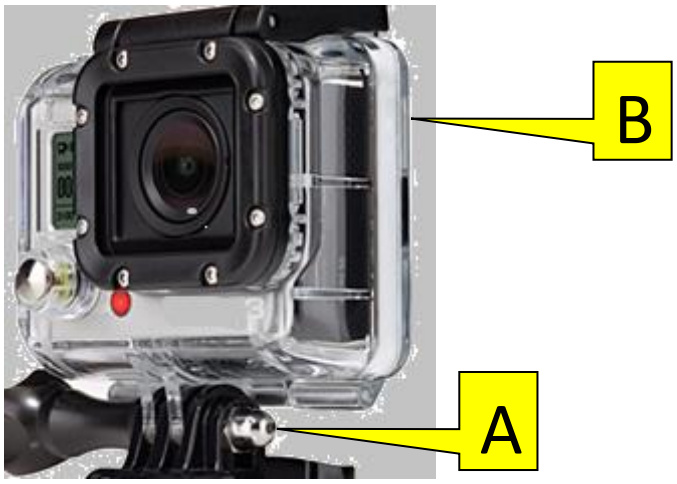
Written Examination: 2 hours

80 marks in total

Typical question

Products can often be manufactured from a number of parts that are joined together in a permanent or semi-permanent way.

The product below uses a permanent method of joining the waterproof case (A) and a semi-permanent fixing on the base bracket (B). The camera is able to tilt and be locked at different angles.



Waterproof Camera

(a) State the semi-permanent method of joining the fixing on the base (A) and justify why this method has been chosen in relation to the product shown. [4]

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The answer must be detailed and relate to the method of fixing the camera to the bracket in a semi-permanent way. The response must justify the method chosen in relation to its use.

Exemplar Answer:

The method used is a hinged pin that allows the camera angle to be adjusted and locked in position. The base of the camera body is moulded to form two fins which fit into two slots that are positioned either side of the fins. A hole positioned in the same place and aligned on each part allows a pin to be located. The pin is then fixed in position with a domed end nut that fits onto a threaded end of the hinge pin. The nut is held in position in a recess that allows the hinge pin to be tightened or loosened to adjust or lock the angle of the camera. An ergonomically shaped handle is fixed to one end allowing it to be used to tighten or loosen the hinge pin. This method also allows the product to be disassembled without damaging the product if necessary.

(b) The two parts of the case use a permanent method of fixing (B); they are glued together using a waterproof adhesive. Using notes and sketches explain and justify how the strength of the permanent fixing method could be improved without the use of any other external fixing, such as a nut and bolt or self-tapping screw. [4]

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The answer must include sketches and notes to explain the answer given. The body of the camera B is permanently fixed together with a waterproof adhesive to protect the electrical components of the camera from exposure to water. However, the joining area or split line where the case is fixed with adhesive has a very small surface area making this join a weak point.

In order to make this stronger making the wall thickness of the join bigger or thicker could increase the surface area. This would increase the surface area to apply the adhesive making the join stronger. There could also be a recess making the two mouldings join together so that one fits inside the other. This would also increase the surface area for the adhesive making the join stronger. If holes for screws, nuts and bolts are used this would create a problem and allow access for water to get inside the product. This is the reason why a waterproof adhesive has been chosen to use.

Typical question

Production processes are used to manufacture products. Shown below is a selfie-stick used to hold mobile phones.

Selfie-stick

Mobile phone holder

The telescopic handle is made by extrusion and the mobile phone holder is made by injection moulding.

Evaluate the suitability of extrusion and injection moulding for these two components. [8]

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The answer must be evaluative and justify the suitability of extrusion and injection moulding for the two parts of the product. Responses should be justified giving a reason for the choice of manufacturing process used to manufacture each of the products.

Extrusion is a suitable method for the telescopic handle of the selfie-stick as the handle can be moulded in one piece that is hollow, allowing the telescopic component of the handle to be located inside. The taper on the handle can also be created using this method of manufacture. The handle also has a texture to improve the user's grip; this would have been added to the part whilst it is still warm. The method of extrusion allows the profile shape of the handle to be pulled though a die in order to create the desired shape. It could be solid or hollow. In this case it is hollow to accommodate the metal telescopic component.

Sketches must be used to accompany this response.

Injection moulding is used to manufacture the mobile phone holder as the component part requires accuracy and also requires more than one part to interact with each other to function. The holder slides apart in order to allow various phones to fit in between the holder. This means that there are two parts that slide together and apart allowing adjustment. It would probably have been injection moulded to accept a spring that would keep the two parts in tension. There is also a recess for a foam pad to be fixed. This is required to protect the edges of the phone when it is fixed into the holder. There is also a vertical arm that is also fixed to the mobile phone holder. The process of injection moulding would also allow for multiple parts to be fixed together more accurately. Injection moulding has been chosen to manufacture the product on a larger scale and also allows the opportunity to manufacture the component parts in different colours.

The iterative design based question

The aim of the design question is to:

- test real knowledge and understanding across the whole of AS specification;
- the learner's ability to apply the iterative process of designing.

Note: The iterative design based question will not be the same each year and it is essential for learners to be aware that the format and style will change.

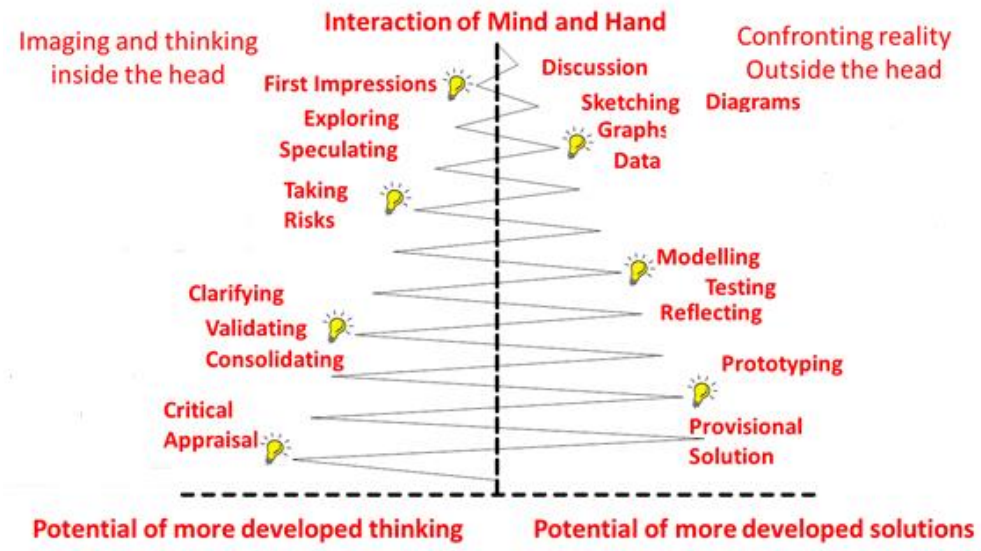
The answer may include sketches to support answers given. Communication by sketching in 2D, 3D, sections with annotation and notes to explain the learner's responses are tested here. The question could focus on any part of the Iterative Design Process testing the learner's ability to apply the iterative process of designing and knowledge and understanding across the specification.

Unit 2 – Design and make task – Engineering Design, Fashion and Textiles and Product Design

For both the 'design and make' task and the 'design and make' project the process of iteration is essential for units 2 and 4.

Design iteration

Definition: A design method based on the process of prototyping, testing, analysing, and refining a product or process. It is not method that will follow the traditional linear path to create a desired outcome but a cyclic one.



Interaction of Mind and Hand model
Source: Modified from The Design and Technology Association http://bit.ly/2BtDKJh

The following links are available for you to watch to support and develop your understanding of the iterative process.

- https://www.youtube.com/watch?v=16rGwTX4NcM
- https://www.youtube.com/watch?v=WcFSZGvXtjA

Teacher guidance during the design and make task/project

You are allowed to guide/support the learner through the iterative process. It essential that at during the process that you check the learner is not going to attempt a design brief that would be challenging and beyond the capabilities of the learner. For further details on teacher guidance please refer to pages 31 - 33 of the specification.

Design and make task Unit 2

NEA – Non Examined Assessment –
Approximately 40 hours
Design and make task from learner's devised challenge
Applies the iterative process of designing.

The focus of design and make task of the learner should be based on the knowledge, understanding and skills of the engineering design course.

A sustained design and make task test the assessing learners' ability to apply the iterative approach to:

- identify, investigate, analyse and outline design possibilities
- design and make prototypes and evaluate their fitness for purpose.

Marked and standardised internally and moderated by an approved visiting moderator.

Requirements

Suggested structure of evidence required

Informal ‘sketchbook’ and Formal ‘portfolio’.

1. Informal A4/A3 sketchbook/s

This will be clearly:

- *identifying design possibilities*
- *generating and developing design ideas. (Including records of development models).*

Note: Centres do not need purchase an A4/A3 sketchbook this does not have to be a bound book, it could be, or it could be a series of A3 pages stapled together, or it could be series of A3 and A4 pages bound together. How exactly you present the work is up to the individual centre, you must though remember to track the work and record clearly where marks have been awarded against the assessment marking criteria.

- Sketchbooks do not necessarily need to be bound books.
- They could be a series of A4 or A3 pages stapled together, or it could be series of A3 and A4 pages bound together.
- Presentation of the work is at the discretion of the individual centre.
- It is important to **track the work and record** clearly where marks have been awarded against the assessment criteria.

2. Formal presentation A3 portfolio will include evidence of:

- *final brief and specification*
- *final prototype – pictorial details*
- *final prototype – technical details*
- *final prototype – production details*
- *sequence of production*
- *evaluation of final prototype*
- *modifications and further developments*
- *photographs testing of final prototype*

3. Make/practical outcomes

Final prototype (fully functioning high quality product)
Any supporting practical pieces including models, jigs, formers, patterns, tests, trials, iterations.

Assessment criteria for the design and make contextual challenge.

Assessment criteria		Marks	Assessment objective	Guidance
(a)	***Identifying and investigating design possibilities***	*10*	*AO 1*	• *The design context must be analysed critically* • *There will be a number of possible design tasks identified.* • *Detailed and relevant research will be evident* • *Consider the users* • *Analysis of existing products* • *Research into past / present professionals*
(b)	Developing a design brief and specification.	10		
(c)	Generating and developing design ideas.	30	AO 2	
(d)	Manufacturing a prototype.	30		
(e)	Analysing and evaluating design decisions and prototypes.	20	AO 3	
	Total	100		

(a) **Identifying and investigating design possibilities** **[AO1]** *The candidate has:*	**Band**
10 – 12 marks • undertaken thorough and effective identification of opportunities for the development of designs • undertaken detailed, relevant, wide-ranging research and investigation • undertaken detailed and effective analysis of information, reflecting the needs, wants and values of potential users • identified a broad range of problems/opportunities to clearly inform the development of possible design briefs	**4**
7 – 9 marks • undertaken effective identification of opportunities for the development of designs • undertaken relevant, wide-ranging research and investigation • undertaken effective analysis of information, reflecting the needs, wants and values of potential users • identified a range of problems/opportunities to inform the development of possible design briefs	**3**
4 – 6 marks • identified some opportunities for the development of designs • undertaken research and investigation • undertaken some analysis of information, though the needs, wants and values of potential users may not have not been fully considered • identified some problems/opportunities which partially inform the development of possible design briefs	**2**
1 – 3 marks • identified one opportunity for the possible development of designs • undertaken little research and investigation • undertaken a basic analysis of information, with little or no consideration of the needs, wants and values of potential users • identified few problems/opportunities and developed a design brief with little reference to their investigations	**1**
0 marks • produced no work that is worthy of a mark	

Checklist

Identifying a need

Explain the following to define the design situation clearly in words and drawings/photographs:

- what are the aims of the project?
- who is the product intended for, the target audience?
- how often is the product likely to be used?
- where will the product be used?
- will the existing environment affect the design of the product?

Identify user needs

- list all the qualities that you think the intended user may demand of your product;
- undertake focussed market research on your target audience to establish their wants/needs;
- present a comparative analysis of your results.

Evaluating existing products

- use the specification to evaluate existing products;
- present a range of existing products;
- explain why the particular products were for evaluation (target audience, market sector etc.);
- annotate the important design features of the products and explain how these features may shape or influence the development of the brief and design specification;
- annotate the weak design features of the products;
- explain why existing products might not fulfil the wants/needs of the target audience.

Design considerations

- produce a 'mood, theme and/or lifestyle board' for the design work;
- explain the design features that you think the product must have;
- assess the importance of a range of design considerations to the design task;
- describe any unique selling points or special features that the product might have.

Research

- identify relevant knowledge and understanding that are needed to help when designing;
- identify the likely sources of this information;
- place other material in a separate ring binder or document wallet.

Assessment criteria		Marks	Assessment objective	Guidance
(a)	Identifying and investigating design possibilities	10	AO 1	• *Opportunities are carefully considered before final brief* • *Understand the task and the needs and wants of users* • *A clearly defined design brief is evident.* • *A detailed specification is generated to drive designing* • *Measurable criteria included.* • *The specification is used throughout the designing process*
(b)	***Developing a design brief and specification.***	*10*		
(c)	Generating and developing design ideas.	30	AO 2	
(d)	Manufacturing a prototype.	30		
(e)	Analysing and evaluating design decisions and prototypes.	20	AO 3	
	Total	100		

(b)	**Developing a design brief and specification** [AO1] *The candidate has:*	**Band**
	10 – 12 marks • fully considered a broad range of problems/opportunities before deciding upon a final design brief • demonstrated a thorough understanding of the task ahead and the requirements which have to be met, to satisfy the needs, wants and values of potential users • generated a design brief, relevant to the need/problem and clearly based upon a thorough analysis of their research and investigation • produced a detailed, relevant specification, including a broad range of objective and measurable criteria, to direct and inform the design and manufacture of a prototype	**4**
	7 – 9 marks • considered a range of problems/opportunities before deciding upon a final design brief • demonstrated a good understanding of the task ahead and most of the requirements which have to be met, to satisfy most of the needs, wants and values of potential users • generated a design brief, relevant to the need/problem, based upon a general analysis of their research and investigation • produced a relevant specification, including a range of objective and measurable criteria, to inform the design and manufacture of a prototype	**3**
	4 – 6 marks • considered some problems/opportunities before deciding on a final design brief • demonstrated a general understanding of the task ahead and one or two requirements have been identified to satisfy some of the needs, wants and values of potential users • generated a design brief, based upon some aspects of the analysis of their research and investigation • produced a specification, including the key points, to partially inform the design and manufacture of a prototype	**2**
	1 – 3 marks • focussed on a single opportunity to produce a design brief • demonstrated a limited understanding of the task ahead, with little or no consideration of the needs, wants and values of potential users • generated a design brief based upon simple analysis of their research and investigation • produced a small range of partially appropriate specification points	**1**
	0 marks • produced no work that is worthy of a mark	

Learners must realise that an extended specification must be continually used as a design tool to measure the viability of potential ideas. Evidence of the use of the specification must be provided in design thinking. The specification should take account of a wide range of factors, sufficient to result in a quality solution to the problem and learners should also include a mix of qualitative and quantitative criteria.
It is important when learners develop their specification that they realise that it is probable that other features could be included as they progress along the problem solving route. This further exemplifies the iterative nature of designing. The specification must address the needs of the target audience and as such should include the essential features of the anticipated product. It should also include unique selling points of the intended outcome.

The specification may be written as short phrases as these are able to be kept in mind whilst designing. However, these bullet points must be fully described to ensure clarity for other readers and to communicate the exact nature of the specification point.

Learners should also bear in mind the extent and quality of the specification as it will later be used as a guide to measure the quality of the product when evaluating it.

Checklist

Design brief and specifications

- write an initial design brief as a short, clear statement of intent;
- make a detailed broad product specification which should be a reflection of the analysis/research work;
- include specifications required by a client or consumer;
- consider a hierarchy of features to direct and inform the design and manufacture of a prototype;
- use qualitative and quantitative performance criteria;
- include the unique selling points of the product.

Assessment criteria		Marks	Assessment objective	Guidance
(a)	Identifying and investigating design possibilities	10	AO 1	• *30% of the NEA* • *An iterative approach is required.* • *A range of design strategies.* • *Clear and effective testing.* • *Analysis against specification identifies further refinements.* • *Testing and selection of :* *Materials* *Components* *Dimensions* *Manufacturing / production* *Finishing* • *High level skills evident*
(b)	Developing a design brief and specification.	10		
(c)	***Generating and developing design ideas.***	30	*AO 2*	
(d)	Manufacturing a prototype.	30		
(e)	Analysing and evaluating design decisions and prototypes.	20	AO 3	
	Total	100		

(c) **Generating and developing design ideas** [AO2] *The candidate has:*	**Band**
16 – 20 marks • considered a range of design strategies, techniques and approaches and applied an iterative design process to generate and communicate a broad and diverse range of initial ideas • identified and thoroughly considered social, moral and ethical factors which are relevant to the need/problem and potential user(s) • made very good use of modelling and testing to evolve ideas and to support decision making • developed a detailed proposal, including comprehensive and relevant details of materials, dimensions, finishes and production techniques, which clearly addresses all requirements of the design brief and specification • demonstrated sophisticated use of a range of skills/techniques to clearly communicate ideas and proposals to a third party	**4**
11 – 15 marks • considered a range of design strategies, techniques and approaches and applied an iterative design process to generate and communicate a broad range of initial ideas • identified and considered social, moral and ethical factors which are generally relevant to the need/problem and potential user(s) • made good use of modelling and testing to evolve ideas and to support decision making • developed a proposal, including relevant details of materials, dimensions, finishes and production techniques, which addresses the main requirements of the design brief and specification • demonstrated good use of a range of skills/techniques to communicate ideas and proposals to a third party	**3**

6 – 10 marks • considered some design strategies and techniques and applied an iterative design process to generate and communicate a range of initial ideas • identified social, moral and ethical factors with some attempt to relate these to the need/problem and potential user(s) • made some use of modelling and/or testing to evolve ideas and to support decision making • developed a proposal, including some details of materials, dimensions, finishes and/or production techniques, which addresses some requirements of the design brief and specification • demonstrated satisfactory use of a small range of skills/techniques to communicate ideas and proposals to a third party	**2**
1 – 5 marks • applied an iterative design process to generate and communicate a limited range of undeveloped initial ideas • identified aspects of social, moral and ethical factors, though these are not closely related to the need/problem and or potential user(s) • made little or no use of modelling and/or testing to evolve ideas • developed a proposal, with superficial details of materials, dimensions, finishes and/or production techniques which addresses few requirements of the design brief and/or specification • demonstrated limited ability to communicate their idea(s) to a third party	**1**
0 marks • produced no work that is worthy of a mark	

It is important that learners use sketchbooks to bring their iterative design thoughts into reality as quick freehand line drawings initially; they can then be worked upon to develop greater clarification of the design insight. It is here that they can blast ideas and suggest forms of the solution without the presentation constraints that can constrict creative idea generation.

These ideas or suggestions can then be further developed in the design folio in order to assess their viability and to make decisions about their possible selection for further design development. The use of ICT, vector design software or solid modelling software, in early idea generation is to be encouraged if it leads to a greater understanding of the form or features of the product.

Supplementary to design drawings of course are three dimensional models or mock-ups. Learners are encouraged to 'get into 3D'; as soon as possible. Nothing tells the designer more about shape, form and proportion than a scale model using appropriate materials to produce a quick resulting model.

When learners work up possible ideas to test their viability it is important that they use information gained during their research and that the specification is impacting upon their designing.

From the 'light touch' of knowledge used in initial ideas learners should now be getting much more specific as their optimum solution evolves. This is where they now begin to converge upon a definite proposal. As such, the quality of detail related to the solution should be getting more precise. Material selection and manufacturing processes should be identified along with exact constructional details and probable finishes. Of course, these should match the design specification.

Checklist

Generating design ideas

- produce a comprehensive range of initial ideas with mini-development;
- include material considerations and possible construction techniques;
- annotate design ideas indicating the strengths and weaknesses of these ideas;
- use the specification to assess the strengths/weaknesses of the ideas;
- identify ideas, or parts of the ideas, that can benefit from further development;
- these ideas have potential for further development;
- explain why other designs may not be as successful;
- make models or mock-ups as appropriate to prove and test ideas.

Development of chosen idea using ICT where appropriate

- show clearly which idea has been chosen to develop;
- integrate aspects of other proposals that would improve the product;
- apply as appropriate anthropometric data and explain why this is essential;
- develop a detailed design proposal for prototyping;
- explain all constructional details;
- establish suitable materials and possible alternatives;
- identify components and fixings that would be needed;
- evaluate the strengths of the developing proposals against the specification.

Learners must present a fully developed solution identifying appropriate materials and manufacturing techniques indicated in detail sufficiently clear to be made by a third party without further reference to the designer. However, if there are some fine details, such as fillets or radii, that are not critical to the construction or function of the intended product then learners will not lose marks as a result. The details of the final solution must also meet the requirements set out in the specification.

Learners should produce presentation drawings and client visuals including an appropriate range of graphic techniques. Colour should be used judiciously to demonstrate shape and form and to assist in high quality communication of detail. Although not a test of literacy, poor quality of written communication may influence the quality of this detail. Where appropriate the use of ICT can be very beneficial here, as learners can use the parametric nature of solid modelling software to fully dimension parts and produce rendered images of the final design.

There must be clear evidence within the learners work showing:

- detail drawings in orthographic projection as appropriate;
- parts drawings if required;
- section and/or exploded drawings as appropriate;
- pictorial rendered drawings;
- a cutting list including materials;
- any components and fixings to be used;
- patterns or templates as appropriate.

Learners working in textile materials must produce toiles, full sized patterns with constructional annotation and presentation visuals.

Assessment criteria		Marks	Assessment objective	Guidance
(a)	Identifying and investigating design possibilities	10	AO 1	• *30% of the NEA* • *Stages of production timeline* • *Completed prototype to schedule* • *Successful high level making skills.* • *Excellent appreciation of materials and components* • *High levels of accuracy in outcome* • *Prototype functions perfectly* • *Meeting the user needs and wants*
(b)	Developing a design brief and specification.	10		
(c)	Generating and developing design ideas.	30	*AO 2*	
(d)	***Manufacturing a prototype***	*30*		
(e)	Analysing and evaluating design decisions and prototypes.	20	AO 3	
	Total	100		

(d)	**Manufacturing a prototype** [AO2] *The candidate has:*	**Band**
	16 – 20 marks • clearly communicated relevant details of a logical sequence and achievable timeline for the stages of production and testing of the final prototype • selected and worked with appropriate materials and components to successfully complete the manufacture of the prototype to a defined schedule • implemented a range of appropriate making skills and processes to produce a high quality functioning prototype that meets the requirements of the design specification and is fit for purpose • demonstrated an excellent understanding of the working properties and performance characteristics of the specified materials and, where appropriate, consideration of surface treatments/finishes • selected and safely used a range of specialist tools, appropriate techniques, processes, equipment and machinery with a high level of accuracy and precision to enable the prototype to perform as intended and meet the needs, wants and values of the user	**4**
	11 – 15 marks • communicated details of a logical sequence and achievable timeline for the stages of production and testing of the final prototype • selected and worked with materials and components to successfully complete the manufacture the prototype, generally to a defined schedule • implemented a range of appropriate making skills and processes to produce a good quality functioning prototype that generally meets the requirements of the design specification and is fit for purpose • demonstrated a good understanding of the working properties and performance characteristics of the specified materials and, where appropriate, consideration of surface treatments/finishes • selected and safely used a range of specialist tools, appropriate techniques, processes, equipment and machinery with accuracy and precision to enable the prototype to perform as intended and meet the needs, wants and values of the user	**3**
	6 – 10 marks • communicated details of a sequence for manufacture and testing of the final prototype • selected and worked with materials and components to partly complete the manufacture of the prototype generally to a defined schedule • implemented an adequate range of making skills and processes to produce a functioning prototype that partially meets the requirements of the design specification and is generally fit for purpose • demonstrated an understanding of the main working properties and performance characteristics of the specified materials and, where appropriate, basic consideration of surface treatments/finishes • selected and safely used a range of specialist tools, techniques, processes, equipment and machinery with a degree of accuracy and precision, the prototype generally performs as intended and meets some aspects of the needs, wants and values of the user	**2**

1 – 5 marks • communicated superficial or no details of a sequence for manufacture and/or testing of the final prototype • worked with materials and components to partly completed the manufacture of the prototype • implemented some making skills and processes to produce a partially functioning prototype, aspects of which meet elements of the design specification • demonstrated a limited understanding of the working properties and/or performance characteristics of the specified materials • selected and safely used a range of specialist tools, techniques, processes, equipment and machinery with a limited degree of accuracy, the prototype partially performs as intended though meets few aspects of the needs, wants and values of the user	**1**
0 marks • produced no work that is worthy of a mark	

There must be detailed evidence of planning that has developed before making begins as well as throughout the making process. Quality assurance features should be listed before making begins, e.g. materials of required quality chosen beforehand, manufacturing processes refined to ensure quality, etc.

Forward planning of making activities may be recorded week by week by the learners and this may be recorded in a separate journal. It could be that learners record the progress of their making in the sketchbook. Any modifications required to the design proposal during the making stage should be recorded.

Checklist

Product planning/schedule

- produce a production plan for the product;
- consider quality assurance and quality control procedures;
- list the construction stages for each component;
- include the joining and assembly stages;
- estimate the time requirements for each operation and include this in your production plan;
- identify tools, equipment and processes needed;
- identify and discuss any issues that may require specific skills for manufacturing . For example setting up CNC or laser machines.

** record all planning details in your project report.*

Candidates will be required to demonstrate that they are aware of innovative steps in the use of materials and sophistication in their use. They should also be aware of the functional properties of components.

Product manufacture

- mark out and make all individual components to tolerances;
- prepare necessary joining or processing methods;
- check fit of components;
- assemble components;
- identify any key working properties of selected materials;
- ensure high quality finish of the product;
- record all construction details and activities in the project report.

Health and safety

- undertake risk assessments for all processes and activities to ensure own safety and the safety of others;
- use appropriate Personal Protection Apparatus;
- explain any measures taken by the centre to ensure safe working practice;
- undertake a risk assessment of the final product;
- ensure the user is aware of any risks inherent in the use of the product.

Assessment criteria		Marks	Assessment objective	Guidance
(a)	Identifying and investigating design possibilities	10	AO 1	• *20 marks available.* • *On-going evaluation and analysis of ideas as they develop* • *Appraising concepts through the iterative process* • *A critical analysis and evaluation of the FINAL prototype* • *User trials / testing and opinions of potential users* • *Reflection on feedback and further development issues identified* • *Detailed suggestions for modifications*
(b)	Developing a design brief and specification.	10		
(c)	Generating and developing design ideas.	30	AO 2	
(d)	Manufacturing a prototype.	30		
(e)	***Analysing and evaluating design decisions and prototypes.***	*20*	*AO 3*	
	Total	100		

(e) Analysing and evaluating design decisions and prototypes [AO3] *The candidate has:*	Band
13 – 16 marks • undertaken a thorough, critical, objective analysis, evaluation and testing of their ideas and decisions whilst applying iterative design processes • undertaken a thorough, critical and objective evaluation and testing of the final prototype, taking into account the views of potential users • identified, with detailed reference to relevant qualitative and quantitative criteria, how their design decisions and the final prototype could be further developed or improved to better meet the needs, wants and values of the intended users	**4**
9 – 12 marks • undertaken an objective analysis, evaluation and testing of their ideas and decisions whilst applying iterative design processes • undertaken an objective analysis, evaluation and testing of the final prototype, with some consideration of the views of potential users • identified, with reference to aspects of qualitative and quantitative criteria, how their design decisions and the final prototype could be further developed or improved to better meet the needs, wants and values of the intended user	**3**
5 – 8 marks • undertaken some analysis, evaluation and/or testing of their ideas and decisions whilst applying iterative design processes • undertaken some analysis, evaluation and/or testing of the final prototype, with partial consideration of the views of potential users • identified how their design decisions and the final prototype could be further developed or improved to better meet the needs, wants and values of the intended user	**2**
1 – 4 marks • produced a limited evaluation of their ideas and decisions whilst applying iterative design processes • produced a limited evaluation of the final prototype • partially identified how the final prototype could be further developed or improved	**1**
0 marks • produced no work that is worthy of a mark	

Learners should comment objectively on each of the specification points. It is important that learners use every feature of the specification as evaluation criteria with which they can measure the success of their end product. They should also comment upon any modifications that should be made as a result of this summative evaluation.

They should also provide evidence of testing which can be undertaken by themselves in many circumstances. However, if the product has been designed for a target audience, it is members of that target audience that should undertake the testing, e.g. children's toys.

They should also seek the views of specialists in the field as to the quality of the product against the specification.

Checklist

Evaluating proposal against product specification

- list the specification points;
- evaluate your product against each specification point;
- use your qualitative and quantitative performance criteria;
- show a photograph of the chosen product/system.

Testing

- make reference to any testing/evaluating that has been carried out during the iterative process of designing; i.e. simple models, 3D modelling, CAD modelling, testing of materials;
- devise suitable methods of testing the final product;
- carry out tests on your product/system;
- record your findings including photographs;
- get an end user, from your target audience, to perform a user trip and evaluate the product in use;
- seek expert opinion on your product;
- use feedback to evaluate the product against the performance specification.

Suggestions for modifications

- list all aspects of the design that require modification;
- produce drawings to show the possible modifications;
- if possible carry out modifications;
- obtain feedback on suggested or actual modifications and present this in your project report.

** record all aspects of the evaluation in your project report.*

Summary of what is required for the iterative design and make task

Informal A4/A3 sketchbook	Formal presentation A3 portfolio	Final prototype (fully functioning high quality product)

Exemplar pages can be found on the WJEC website:

http://www.wjec.co.uk/qualifications/design-and-technology/r-design-and-technology-gce-2017/

Unit 3 –Written paper– Engineering Design

Written Examination: 2 hours

100 marks in total

Learners attempt all questions

See sample assessment material:

http://www.wjec.co.uk/qualifications/design-and-technology/r-design-and-technology-gce-2017/wjec-gce-design-technology-sams-from-2017-ed-e.pdf?language_id=1

Unit 3 –Written paper– Fashion and Textiles

Written Examination: 2 hours

100 marks in total

Learners attempt all questions

See sample assessment material:

http://www.wjec.co.uk/qualifications/design-and-technology/r-design-and-technology-gce-2017/wjec-gce-design-technology-sams-from-2017-ft-e.pdf?language_id=1

Unit 3 –Written paper– Product Design

Written Examination: 2 hours

100 marks in total

Learners attempt all questions

See sample assessment material:

http://www.wjec.co.uk/qualifications/design-and-technology/r-design-and-technology-gce-2017/wjec-gce-design-technology-sams-from-2017-pd-e.pdf?language_id=1

Unit 4 Design and make task – Engineering Design, Fashion and Textiles, and Product Design

NEA – Non Examined Assessment –
Approximately 60 hours
Design and make task from learner's devised challenge
Worth 100 raw marks
Applies the iterative process of designing

The focus of design and make task of the learner should be based on the knowledge, understanding and skills of the course being studied.

A sustained design and make task the assessing learners' ability to apply the iterative approach to:

- identify, investigate, analyse and outline design possibilities
- design and make prototypes and evaluate their fitness for purpose.

Marked and standardised internally and moderated by an approved visiting moderator.

Requirements

Suggested structure of evidence required

Informal ‘sketchbook’ and Formal ‘portfolio’.

1. Informal A4/A3 sketchbook

This will be clearly:

- *identifying design possibilities*
- *generating and developing design ideas (including records of development models).*

Note: Centres do not need purchase an A4/A3 sketchbook this does not have to be a bound book, it could be, or it could be a series of A3 pages stapled together, or it could be series of A3 and A4 pages bound together. How exactly you present the work is up to the individual centre, you must though remember to track the work and record clearly where marks have been awarded against the assessment marking criteria.

- Sketchbooks do not necessarily need to be bound books.
- They could be a series of A4 or A3 pages stapled together, or it could be series of A3 and A4 pages bound together.
- Presentation of the work is at the discretion of the individual centre.
- It is important to **track the work and record** clearly where marks have been awarded against the assessment criteria.

Formal presentation A3 portfolio will include evidence of:

- *final brief and specification*
- *final prototype – pictorial details*
- *final prototype – technical details*
- *final prototype – production details*
- *sequence of production*
- *evaluation of final prototype*
- *modifications and further developments*
- *photographs of final prototype*

Make/practical outcomes

Final prototype (fully functioning high quality product)
You must include any supporting practical pieces including models, jigs, formers, patterns, tests, trials, iterations.
Assessment criteria for the design and make contextual challenge.

NOTE: The assessment criteria for the A level project has a 5 banded marking set of criteria.

Assessment criteria		Marks	Assessment objective	Guidance
(a)	***Identifying and investigating design possibilities***	*10*	*AO 1*	• *The design context must be analysed critically* • *There will be a number of possible design tasks identified.* • *Detailed and relevant research will be evident* • *Consider the users* • *Analysis of existing products* • *Research into past / present professionals*
(b)	Developing a design brief and specification.	10		
(c)	Generating and developing design ideas.	30	AO 2	
(d)	Manufacturing a prototype.	30		
(e)	Analysing and evaluating design decisions and prototypes.	20	AO 3	
	Total	100		

(a)	**Identifying and investigating design possibilities** [AO1] *The candidate has:*	**Band**
	13 – 15 marks • considered a range of design strategies, techniques and approaches and undertaken thorough and highly effective identification of opportunities for the development of designs • undertaken comprehensive, relevant, wide-ranging research and investigation • undertaken comprehensive and highly effective analysis of information, reflecting the needs, wants and values of potential users • identified a broad range of problems/opportunities to clearly inform the development of possible design briefs • fully considered relevant approaches to project management, within the constraints of the time and resources available	**5**
	10 – 12 marks • considered a range of design strategies, techniques and approaches and undertaken thorough and effective identification of opportunities for the development of designs • undertaken detailed, relevant, wide-ranging research and investigation • undertaken detailed and effective analysis of information, reflecting the needs, wants and values of potential users • identified a broad range of problems/opportunities to clearly inform the development of possible design briefs • considered relevant approaches to project management, within the constraints of the time and resources available	**4**
	7 – 9 marks • considered some design strategies and techniques and undertaken effective identification of opportunities for the development of designs • undertaken relevant, wide-ranging research and investigation • undertaken effective analysis of information, reflecting the needs, wants and values of potential users • identified a range of problems/opportunities to inform the development of possible design briefs • briefly considered approaches to project management, within the constraints of the time and resources available	**3**

4 – 6 marks • considered some design strategies and identified some opportunities for the development of designs • undertaken research and investigation • undertaken some analysis of information, though the needs, wants and values of potential users may not have not been fully considered • identified some problems/opportunities which partially inform the development of possible design briefs • noted some approaches to project management	**2**
1 – 3 marks • identified one opportunity for the possible development of designs • undertaken little research and investigation • undertaken a basic analysis of information, with little consideration of the needs, wants and values of potential users • identified few problems/opportunities and developed a design brief with basic reference to their investigations • demonstrated little or no consideration of project management	**1**
0 marks • produced no work that is worthy of a mark	

At A level the learner should be encouraged to use a range of design strategies and divergent approaches to problem identification.

This could be initiated as a diverse spray diagram developed from an understanding of the problem parameters followed by focused research of relevant aspects of the problem. The analysis must be focussed on all aspects of the problem/s and with little superfluous information. The learner may have a range of design possibilities to choose from.

It is important that all research/analysis is relevant and will provide material that will be essential when considering the development of a specification and idea generation later in the iterative design process. It is essential that learners reflect upon their research/analysis to determine the extent of their knowledge and understanding of the nature of the problem/s that they could be faced with. Also that they are aware of the needs of their target audience and that their design thinking is directed at them.

Checklist

Identifying a need

Explain the following to define the design situation clearly in words and drawings/photographs:

- what are the aims of the project?
- who is the product intended for, the target audience?
- how often is the product likely to be used?
- where will the product be used?
- will the existing environment affect the design of the product?

Identify user needs

- list all the qualities that you think the intended user may demand of the product;
- undertake focussed market research on your target audience to establish their wants/needs;
- present a comparative analysis of results.

Evaluating existing products

- use the specification to evaluate existing products;
- present a range of existing products;
- explain why you chose the particular products for evaluation (target audience, market sector etc.);
- annotate the important design features of the products and explain how these features may shape or influence the development of the brief and design specification;
- annotate the weak design features of the products;
- explain why existing products might not fulfil the wants/needs of the target audience.

Design considerations

- produce a 'mood, theme and/or lifestyle board' for the design work;
- explain the design features that you think your product must have;
- assess the importance of a range of design considerations to your design task;
- describe any unique selling points or special features that your product might have.

Research

- identify relevant knowledge and understanding that you will need to help you when designing;
- identify the likely sources of this information;
- include a section in the folio that contains the information that will be used
- place other material in a separate ring binder or document wallet.

Assessment criteria		Marks	Assessment objective	Guidance
(a)	Identifying and investigating design possibilities.	10	AO 1	• *Opportunities are carefully considered before final brief* • *Understand the task and the needs and wants of users* • *A clearly defined design brief is evident.* • *A detailed specification is generated to drive designing* • *Measurable criteria included.* • *The specification is used throughout the designing process*
(b)	***Developing a design brief and specification.***	*10*		
(c)	Generating and developing design ideas.	30	AO 2	
(d)	Manufacturing a prototype.	30		
(e)	Analysing and evaluating design decisions and prototypes.	20	AO 3	
	Total	100		

(b)	**Developing a design brief and specification** [AO1] *The candidate has:*	**Band**
	13 – 15 marks • fully considered a comprehensive range of strategies, techniques and approaches to enable them to explore, create and evaluate design ideas • fully considered a comprehensive range of problems/opportunities before deciding upon a final design brief • demonstrated a thorough and detailed understanding of the task ahead and the requirements which have to be met, to satisfy the needs, wants and values of potential users • generated a design brief, clearly based upon a comprehensive and detailed analysis of their research and investigation • produced a detailed, relevant specification, including a comprehensive range of objective and measurable criteria, and the application of relevant standards, to direct and inform the design and manufacture of a prototype	**5**
	10 – 12 marks • considered a broad range of strategies, techniques and approaches to enable them to explore, create and evaluate design ideas • fully considered a broad range of problems/opportunities before deciding upon a final design brief • demonstrated a thorough understanding of the task ahead and the requirements which have to be met, to satisfy the needs, wants and values of potential users • generated a design brief, clearly based upon a thorough analysis of their research and investigation • produced a detailed, relevant specification, including a broad range of objective and measurable criteria, and the application of relevant standards, to direct and inform the design and manufacture of a prototype	**4**
	7 – 9 marks • considered a range of strategies, techniques and approaches to enable them to explore, create and evaluate design ideas • considered a range of problems/opportunities before deciding upon a final design brief • demonstrated a good understanding of the task ahead and most of the requirements which have to be met, to satisfy most of the needs, wants and values of potential users • generated a design brief, based upon a general analysis of their research and investigation • produced a relevant specification, including a range of objective and measurable criteria, and application of relevant standards, to inform the design and manufacture of a prototype	**3**

4 – 6 marks • considered some strategies, techniques and approaches to enable them to explore, create and evaluate design ideas • considered some problems/opportunities before deciding on a final design brief • demonstrated a general understanding of the task ahead and one or two requirements have been identified to satisfy some of the needs, wants and values of potential users • generated a design brief, based upon some aspects of the analysis of their research and investigation • produced a specification, including the key points, to partially inform the design and manufacture of a prototype	**2**
1 – 3 marks • briefly considered a strategy, approach or technique with the potential to help them explore, create and evaluate design ideas • focussed on a single opportunity to produce a design brief • demonstrated a limited understanding of the task ahead, with little or no consideration of the needs, wants and values of potential users • generated a design brief based upon simple analysis of their research and investigation • produced a small range of partially appropriate specification points	**1**
0 marks • produced no work that is worthy of a mark	

The learners must compose a clearly defined brief that is linked to their research/investigation tasks and includes where appropriate measurable criteria.

Learners must realise that an extended specification must be continually used as a design tool to measure the viability of potential ideas. Evidence of the use of the specification must be provided in design thinking. The specification should take account of a wide range of factors, sufficient to result in a quality solution to the problem and learners should also include a mix of qualitative and quantitative criteria.

It is important when learners develop their specification that they realise that it is probable that other features could be included as they progress along the problem solving route. This further exemplifies the iterative nature of designing. The specification must address the needs of the target audience and as such should include the essential features of the anticipated product. It should also include unique selling points of the intended outcome.

The specification may be written as short phrases as these are able to be kept in mind whilst designing. However, these bullet points must be fully described to ensure clarity for other readers and to communicate the exact nature of the specification point.

Learners should also bear in mind the extent and quality of the specification as it will later be used as a guide to measure the quality of the product when evaluating it.

Checklist

Design brief and specifications

- write an initial design brief as a short, clear statement of intent;
- make a detailed broad product specification which should be a reflection of the analysis/research work;
- include specifications required by a client or consumer;
- consider a hierarchy of features to direct and inform the design and manufacture of a prototype;
- use qualitative and quantitative performance criteria;
- include the unique selling points of the product.

Assessment criteria		Marks	Assessment objective	Guidance
(a)	Identifying and investigating design possibilities.	10	AO 1	• *30% of the NEA* • *An iterative approach is required.* • *A range of design strategies.* • *Clear and effective testing.* • *Analysis against specification identifies further refinements.* • *Testing and selection of :* *Materials* *Components* *Dimensions* *Manufacturing / production* *Finishing* • *High level skills evident*
(b)	Developing a design brief and specification.	10		
(c)	***Generating and developing design ideas.***	30	*AO 2*	
(d)	Manufacturing a prototype.	30		
(e)	Analysing and evaluating design decisions and prototypes.	20	AO 3	
	Total	100		

(c)	**Generating and developing design ideas** [AO2] *The candidate has:*	**Band**
	21 – 25 marks • applied an iterative design process to generate and communicate a comprehensive and diverse range of initial ideas • clearly identified and thoroughly considered environmental, sustainability, costs, social, moral and ethical factors, which are relevant to the design and potential user(s) • made excellent use of modelling and testing to evolve ideas and to support decision making • developed a detailed proposal, including comprehensive and relevant details of materials, dimensions, finishes and production techniques, which clearly addresses all requirements of the design brief and specification • fully considered the manufacture of the prototype, including planning for accuracy and efficiency and, where appropriate, making recommendations for different scales of production • demonstrated sophisticated and highly effective use of a range of skills/techniques to clearly communicate ideas and proposals to a third party	**5**
	16 – 20 marks • applied an iterative design process to generate and communicate a broad and diverse range of initial ideas • identified and thoroughly considered environmental, sustainability, costs, social, moral and ethical factors which are relevant to the design and potential user(s) • made very good use of modelling and testing to evolve ideas and to support decision making • developed a detailed proposal, including comprehensive and relevant details of materials, dimensions, finishes and production techniques, which clearly addresses all requirements of the design brief and specification • considered the manufacture of the prototype, including planning for accuracy and efficiency and, where appropriate, making recommendations for different scales of production • demonstrated sophisticated use of a range of skills/techniques to clearly communicate ideas and proposals to a third party	**4**

11 – 15 marks • applied an iterative design process to generate and communicate a broad range of initial ideas • identified and considered environmental, sustainability, costs, social, moral and ethical factors which are generally relevant to the design and potential user(s) • made good use of modelling and testing to evolve ideas and to support decision making • developed a proposal, including relevant details of materials, dimensions, finishes and production techniques, which addresses the main requirements of the design brief and specification • considered the manufacture of the prototype, including some planning for accuracy and/or efficiency and, where appropriate, making brief recommendations for different scales of production • demonstrated good use of a range of skills/techniques to communicate ideas and proposals to a third party	**3**
6 – 10 marks • applied an iterative design process to generate and communicate a range of initial ideas • identified a number of factors from environmental, sustainability, costs, social, moral and ethical, with some attempt to relate these to the design and potential user(s) • made some use of modelling and/or testing to evolve ideas and to support decision making • developed a proposal, including some details of materials, dimensions, finishes and/or production techniques, which addresses some requirements of the design brief and specification • considered the manufacture of the prototype, including some planning for accuracy and/or efficiency • demonstrated satisfactory use of a small range of skills/techniques to communicate ideas and proposals to a third party	**2**
1 – 5 marks • applied an iterative design process to generate and communicate a limited range of undeveloped initial ideas • identified a number of factors from environmental, sustainability, costs, social, moral and ethical, though these are not closely related to the design and or potential user(s) • made little use of modelling and/or testing to evolve ideas • developed a proposal, with superficial details of materials, dimensions, finishes and/or production techniques which addresses few requirements of the design brief and/or specification • demonstrated limited ability to communicate their idea(s) to a third party	**1**
0 marks • produced no work that is worthy of a mark	

It is important that learners use sketchbooks to bring their iterative design thoughts into reality as quick freehand line drawings initially; they can then be worked upon to develop greater clarification of the design insight. It is here that they can blast ideas and suggest forms of the solution without the presentation constraints that can constrict creative idea generation.

These ideas or suggestions can then be further developed in the design folio in order to assess their viability and to make decisions about their possible selection for further design development. The use of ICT, vector design software or solid modelling software, in early idea generation is to be encouraged if it leads to a greater understanding of the form or features of the product.

Supplementary to design drawings of course are three dimensional models or mock-ups. Learners are encouraged to 'get into 3D'; as soon as possible. Nothing tells the designer more about shape, form and proportion than a scale model using appropriate materials to produce a quick resulting model.

When learners work up possible ideas to test their viability it is important that they use information gained during their research and that the specification is impacting upon their designing.

From the 'light touch' of knowledge used in initial ideas learners should now be getting much more specific as their optimum solution evolves. This is where they now begin to converge upon a definite proposal. As such, the quality of detail related to the solution should be getting more precise. Material selection and manufacturing processes should be identified along with exact constructional details and probable finishes. Of course, these should match the design specification.

Checklist

Generating design ideas

- produce a comprehensive range of initial ideas with mini-development;
- include material considerations and possible construction techniques;
- annotate design ideas indicating the strengths and weaknesses of these ideas;
- use the specification to assess the strengths/weaknesses of ideas;
- identify ideas, or parts of the ideas, that can benefit from further development;
- say why these ideas have potential for further development;
- explain why other designs may not be as successful;
- make models or mock-ups as appropriate to prove and test ideas.

Development of chosen idea using ICT where appropriate

- show clearly which idea has been chosen to develop;
- integrate aspects of other proposals that would improve the product;
- apply as appropriate anthropometric data and explain why this is essential;
- develop a detailed design proposal for prototyping;
- explain all constructional details;
- establish suitable materials and possible alternatives;
- identify components and fixings that would be needed;
- evaluate the strengths of the developing proposals against the specification.

Learners must present a fully developed solution identifying appropriate materials and manufacturing techniques indicated in detail sufficiently clear to be made by a third party without further reference to the designer. However, if there are some fine details, such as fillets or radii, that are not critical to the construction or function of the intended product then learners will not lose marks as a result. The details of the final solution must also meet the requirements set out in the specification.

Learners should produce presentation drawings and client visuals including an appropriate range of graphic techniques. Colour should be used judiciously to demonstrate shape and form and to assist in high quality communication of detail. Although not a test of literacy poor quality of written communication may influence the quality of this detail. Where appropriate the use of ICT can be very beneficial here, as learners can use the parametric nature of solid modelling software to fully dimension parts and produce rendered images of the final design.

There must be clear evidence within the learners work showing:

- detail drawings in orthographic projection as appropriate;
- parts drawings if required;
- section and/or exploded drawings as appropriate;
- pictorial rendered drawings;
- a cutting list including materials;
- any components and fixings to be used;
- patterns or templates as appropriate.

Learners working in textile materials must produce toiles, full sized patterns with constructional annotation and presentation visuals.

Assessment criteria		Marks	Assessment objective	Guidance
(a)	Identifying and investigating design possibilities.	10	AO 1	• *30% of the NEA* • *Stages of production timeline* • *Completed prototype to schedule* • *Successful high level making skills.* • *Excellent appreciation of materials and components* • *High levels of accuracy in outcome* • *Prototype functions perfectly* • *Meeting the user needs and wants*
(b)	Developing a design brief and specification.	10		
(c)	Generating and developing design ideas.	30	AO 2	
(d)	***Manufacturing a prototype.***	*30*		
(e)	Analysing and evaluating design decisions and prototypes.	20	AO 3	
	Total	100		

(d)	**Manufacturing a prototype** [AO2] *The candidate has:*	**Band**
	21 – 25 marks • clearly and comprehensively communicated relevant details of a logical sequence and achievable timeline for the stages of production and testing of the final prototype • selected and worked with appropriate materials and components to successfully complete the manufacture of the prototype to a defined schedule • implemented a range of appropriate making skills and processes to produce a very high quality fully-functioning prototype that meets the requirements of the design specification and is fit for purpose • demonstrated an excellent understanding of the working properties and performance characteristics of the specified materials and, where appropriate, detailed consideration of surface treatments/finishes for functional and aesthetic purposes • selected and safely used a range of specialist tools, appropriate techniques, processes, equipment and machinery with considerable accuracy and precision to enable the prototype to perform as intended and meet the needs, wants and values of the user	**5**
	16 – 20 marks • clearly communicated relevant details of a logical sequence and achievable timeline for the stages of production and testing of the final prototype • selected and worked with appropriate materials and components to successfully complete the manufacture of the prototype to a defined schedule • implemented a range of appropriate making skills and processes to produce a high quality functioning prototype that meets the requirements of the design specification and is fit for purpose • demonstrated very good understanding of the working properties and performance characteristics of the specified materials and, where appropriate, consideration of surface treatments/finishes for functional and aesthetic purposes • selected and safely used a range of specialist tools, appropriate techniques, processes, equipment and machinery with a high level of accuracy and precision to enable the prototype to perform as intended and meet the needs, wants and values of the user	**4**

11 – 15 marks • communicated details of a logical sequence and achievable timeline for the stages of production and testing of the final prototype • selected and worked with appropriate materials and components to successfully complete the manufacture the prototype, generally to a defined schedule • implemented a range of appropriate making skills and processes to produce a good quality functioning prototype that generally meets the requirements of the design specification and is fit for purpose • demonstrated a good understanding of the working properties and performance characteristics of the specified materials and, where appropriate, consideration of surface treatments/finishes • selected and safely used a range of specialist tools, appropriate techniques, processes, equipment and machinery with accuracy and precision to enable the prototype to perform as intended and meet the needs, wants and values of the user	**3**
6 – 10 marks • communicated details of a sequence for manufacture and testing of the final prototype • selected and worked with materials and components to partly complete the manufacture of the prototype generally to a defined schedule • implemented an adequate range of making skills and processes to produce a functioning prototype that partially meets the requirements of the design specification and is generally fit for purpose • demonstrated an understanding of the main working properties and performance characteristics of the specified materials, and, where appropriate, basic consideration of surface treatments/finishes • selected and safely used a range of specialist tools, techniques, processes, equipment and machinery with a degree of accuracy and precision, the prototype generally performs as intended and meets some aspects of the needs, wants and values of the user	**2**
1 – 5 marks • communicated superficial or no details of a sequence for manufacture and/or testing of the final prototype • worked with materials and components to partly complete the manufacture of the prototype • Implemented some making skills and processes to produce a partially functioning prototype, aspects of which meet elements of the design specification • Demonstrated a limited understanding of the working properties and/or performance characteristics of the specified materials • selected and safely used a range of specialist tools, techniques, processes, equipment and machinery with a limited degree of accuracy, the prototype partially performs as intended though meets few aspects of the needs, wants and values of the user	**1**
0 marks • produced no work that is worthy of a mark	

There must be detailed evidence of planning that has been developed before making begins as well as throughout the making process. Quality assurance features should be listed before making begins, e.g. materials of required quality chosen beforehand, manufacturing processes refined to ensure quality, etc.

Forward planning of making activities may be recorded week by week by the learners and this may be recorded in a separate journal. It could be that learners record the progress of their making in the sketchbook. Any modifications required to the design proposal during the making stage should be recorded.

Checklist

Product planning

- produce a production plan for the product;
- consider quality assurance and quality control procedures;
- list the construction stages for each component;
- include the joining and assembly stages;
- estimate the time requirements for each operation and include this in the production plan;
- identify tools, equipment and processes needed;
- identify personal training needs.

* *record all planning details in* the *project report.*

Learners will be required to demonstrate that they are aware of innovative steps in the use of materials and sophistication in their use. They should also be aware of the functional properties of components.

Product manufacture

- mark out and make all individual components to tolerances;
- prepare necessary joining or processing methods;
- check fit of components;
- assemble components;
- identify any key working properties of selected materials;
- ensure high quality finish of the product;
- record all construction details and activities in the project report.

Health and safety

- undertake risk assessments for all processes and activities to ensure own safety and the safety of others;
- use appropriate Personal Protection Apparatus;
- explain any measures taken by the centre to ensure safe working practice;
- undertake a risk assessment of your final product;
- ensure the user is aware of any risks inherent in the use of the product.

Assessment criteria		Marks	Assessment objective	Guidance
(a)	Identifying and investigating design possibilities.	10	AO 1	• *20 marks available.* • *On-going evaluation and analysis of ideas as they develop* • *Appraising concepts through the iterative process* • *A critical analysis and evaluation of the FINAL prototype* • *User trials / testing and opinions of potential users* • *Reflection on feedback and further development issues identified* • *Detailed suggestions for modifications*
(b)	Developing a design brief and specification.	10		
(c)	Generating and developing design ideas.	30	AO 2	
(d)	Manufacturing a prototype.	30		
(e)	***Analysing and evaluating design decisions and prototypes.***	*20*	*AO 3*	
	Total	100		

(e)	**Analysing and evaluating design decisions and prototypes** [AO3] *The candidate has:*	**Band**
	17 – 20 marks • undertaken thorough and detailed, critical, objective analysis, evaluation and testing of their ideas and decisions whilst applying iterative design processes • undertaken a thorough and detailed, critical and objective evaluation and testing of the final prototype, taking into account the views of potential users • identified, with comprehensive and detailed reference to relevant qualitative and quantitative criteria, how their design decisions and the final prototype could be further developed or improved to better meet the needs, wants and values of the intended users throughout the product life cycle	**5**
	13 – 16 marks • undertaken thorough, critical, objective analysis, evaluation and testing of their ideas and decisions whilst applying iterative design processes • undertaken thorough, critical and objective evaluation and testing of the final prototype, taking into account the views of potential users • identified, with detailed reference to relevant qualitative and quantitative criteria, how their design decisions and the final prototype could be further developed or improved to better meet the needs, wants and values of the intended users throughout the product life cycle	**4**
	9 – 12 marks • undertaken an objective analysis, evaluation and testing of their ideas and decisions whilst applying iterative design processes • undertaken an objective analysis, evaluation and testing of the final prototype, with some consideration of the views of potential users • identified, with reference to aspects of qualitative and quantitative criteria, how their design decisions and the final prototype could be further developed or improved to better meet the needs, wants and values of the intended user	**3**

5 – 8 marks • undertaken some analysis, evaluation and/or testing of their ideas and decisions whilst applying iterative design processes • undertaken some analysis, evaluation and/or testing of the final prototype, with partial consideration of the views of potential users • identified how their design decisions and the final prototype could be further developed or improved to better meet the needs, wants and values of the intended user	**2**
1 – 4 marks • produced a limited evaluation of their ideas and decisions whilst applying iterative design processes • produced a limited evaluation of the final prototype • partially identified how the final prototype could be further developed or improved	**1**
0 marks • produced no work that is worthy of a mark	

Learners should comment objectively on each of the specification points. It is important that learners use every feature of the specification as evaluation criteria with which they can measure the success of their end product. They should also comment upon any modifications that should be made as a result of this summative evaluation.

They should also provide evidence of testing which can be undertaken by themselves in many circumstances. However, if the product has been designed for a target audience, it is members of that target audience that should undertake the testing, e.g. children's toys.

They should also seek the views of specialists in the field as to the quality of the product against the specification.

Checklist

Evaluating proposal against product specification

- list the specification points;
- evaluate the product against each specification point;
- use qualitative and quantitative performance criteria;
- show a photograph of the chosen product/system.

Testing

- make reference to any testing/evaluating that has been carried out during the iterative process of designing; i.e. simple models, 3D modelling, CAD modelling, testing of materials;
- devise suitable methods of testing the final product;
- carry out tests on the product/system;
- record findings including photographs;
- get an end user, from the target audience, to perform a user trip and evaluate the product in use;
- seek expert opinion on the product;

- use feedback to evaluate the product against the performance specification.

Suggestions for modifications

- list all aspects of the design that require modification;
- produce drawings to show the possible modifications;
- if possible carry out modifications;
- obtain feedback on suggested or actual modifications and present this in your project report.

** record all aspects of the evaluation in your project report.*

Summary of what is required for the iterative design and make project

Informal A4/A3 sketchbook	Formal presentation A3 portfolio	Final prototype (fully functioning high quality product)

Exemplar pages can be found on the WJEC website:

http://www.wjec.co.uk/qualifications/design-and-technology/r-design-and-technology-gce-2017/

Further support and resources

There are a free range of digital resources available for centres which can be found on:

http://www.wjec.co.uk/qualifications/qualification-resources.html?subject=DesignandTechnology&level=gceAsafrom2017

Examinations and assessment

Command words

To assist teachers when preparing learners for the examination they may like to consider the following information.

This table is intended to define the command words used in papers and explain how they are used and what is expected from the candidate.

Command words	Marks	Comments
Describe Outline	2 marks	These command words will be commonly used on the papers and will feature in many questions. These questions ask the candidate to describe something in detail. The answer will be in sentences and/or in a list. There is a need for detail in the answers with elaboration of the answer. Sometimes the question will ask the candidate to use notes and sketches this means that a clearly labelled sketch or diagram will gain the marks.
Explain Justify	2 or more marks	These command words will be commonly used many questions. These questions are asking the candidate to respond in detail to the question providing a full answer with an explanation. Full and detailed sentences will be required and will often contain the word "because". A short phrase will not be acceptable, the candidate will need to make a valid point and justify it.
Evaluate Analyse	4 or more marks	These command words will feature in high-tariff questions. These questions are designed to test, stretch and challenge the more able candidate. The question requires the candidate to make a well-balanced argument involving both advantages and disadvantages. A paragraph or a number of sentences will be required.

Banded descriptors

This form assessment will be associated with the questions that specifically require an extended answer in the form of an essay for example. It will also be used to in questions where the quality of written communication is to be assessed.

Incorrect/no answer.	**0**
Brief analysis with little detail of…….. Quality of Written Communication is limited, presenting material with limited coherence, many errors of grammar, punctuation and spelling.	**1 - 2**
More detailed analysis, with some explanation of required……... Quality of Written Communication is basic, presenting occasionally appropriate material with some coherence, some errors of grammar, punctuation and spelling.	**3 - 4**
Detailed analysis and explanation of the types of…….. Quality of Written Communication is good, presenting mainly appropriate material in a coherent manner, few errors of grammar, punctuation and spelling.	**5 - 7**
Clear and detailed analysis and explanation of the types of …….. Quality of Written Communication is excellent, presenting wholly appropriate material in a coherent and logical manner, hardly any errors of grammar, punctuation and spelling.	**8 -10**

Suggested frameworks for delivery

<table>
<tr><th colspan="11">WJEC GCE Design and Technology – Year 12 Possible Course Plan</th></tr>
<tr><th colspan="2">Sep</th><th>Oct</th><th>Nov</th><th>Dec</th><th>Jan</th><th>Feb</th><th>Mar</th><th>Apr</th><th>May</th><th>Jun</th><th>Jul</th></tr>
<tr><td colspan="5">Core Technical Principles – knowledge and understanding
• Refining and realising a design – materials, research, modelling, prototyping, reverse engineering.
• Development and manufacturing – development of ideas, writing specifications, 2D and 3D modelling.
• Technologies and communication – presentation techniques, ergonomics and anthropometrics.
• CAD and CAM – software applications, manufacturing.
• Safe working practices – risk assessments, working accurately and creatively with materials.
• Application of technology – problem solving and the integration of science and maths.</td><td colspan="5">In depth Technical Principles – Product Design
• Material characteristics and properties – natural materials, synthetic materials, regenerated materials, alloys and composites.
• Joining methods – permanent, non-permanent, adhesives.
• Surface finishes – self finishing and applied finishing.
• Woods, metals and polymers – performance characteristics of a range of materials, form and manufacturing processes.
• Smart and modern materials – shape memory alloys, their application, electro chromic and photo chromic.
• Production processes – cutting, wasting, use of jigs and formers, prototyping before final production.</td><td rowspan="3">Unit 1 - AS Examination paper in May</td></tr>
<tr><td colspan="10">Core designing and making principles
• Investigation and analysis – analysis of design contexts, needs and wants of potential users, writing specifications, generating performance criteria.
• Design and historic movements – practitioners/movements and their influence on design.
• Designing and making prototypes – using knowledge when designing, making and evaluating prototypes.
• Technological developments – the development of products (classics and icons), global manufacturing, ethical, moral and social considerations.
• Analyse and evaluate ideas – quality assurance procedures, testing performance of products.
• Tools and equipment – using templates, patterns and guides, jigs and fixtures.
• Performance of products – measurements and tolerances ensuring products perform as intended.
• Evaluation and user feedback – evaluating products against performance specification, using target audiences and specialists.</td></tr>
<tr><td colspan="2">Non – exam Assessment</td><td colspan="3">ITERATIVE DESIGNING</td><td colspan="3">MANUFACTURING AND EVALUATING</td><td rowspan="3">• Deadline for NEA marks – May 1st.
• External moderation – 2nd week in May.</td></tr>
<tr><td colspan="2">Identification of design possibilities – design brief developed</td><td colspan="2">Generation and development of ideas</td><td>Generation and refinement of ideas</td><td>Final prototype</td><td colspan="2">Analysing and evaluating decisions</td></tr>
<tr><td colspan="2">Informal sketchbook work/formal portfolio work</td><td colspan="2">Informal sketchbook work/formal portfolio work</td><td>Informal sketchbook work/formal portfolio work</td><td>Manufacturing a prototype</td><td colspan="2">Evaluation of final prototype</td></tr>
</table>

<table>
<tr><th colspan="11">JEC GCE Design and Technology – Year 13 Possible Course Plan</th></tr>
<tr><th colspan="2">Sep</th><th>Oct</th><th>Nov</th><th>Dec</th><th>Jan</th><th>Feb</th><th>Mar</th><th>Apr</th><th>May</th><th>Jun</th><th>Jul</th></tr>
<tr><td colspan="5">Core Technical Principles – knowledge and understanding</td><td colspan="5">In depth Technical Principles – Product Design</td><td rowspan="3" colspan="2">Unit 3 – A level Examination paper (June)</td></tr>
<tr><td colspan="5">• Features of Manufacturing Industry – JIT manufacture, industrial manufacturing methods, and scale of production.
• Health and Safety impact – manufacturing environments, COSHH, PPE
• Feasibility studies – demand, cost of manufacture, commercial viability of products.
• Design for manufacture – product life, development of initial design briefs, maintenance.
• Materials and components/scale of production –environment factors, disposal of waste, by-products and cost.
• Intellectual property – patents, registered design, design right, registered trademarks and copyright.
• Marketing, enterprise and innovation – technology push and market pull, radical and incremental product development, trends and market research.</td><td colspan="5">• Industrial and commercial practice – quality management, 2D and 3D modelling, aesthetic, function and user charts, staffing needs, production across sites or locations, comparative testing.
• Modular and cell production – production systems, standardised components from the perspective of the designer, manufacturer and end-user.
• Rapid prototyping – 3D printing methods and applications, benefits to large and small scale manufacturers.</td></tr>
<tr><td colspan="10">Core designing and making principles</td></tr>
<tr><td colspan="10">• Exploring, creating and evaluating – user centred design, systems thinking and circular economy.
• Project management – critical path analysis, scrum and six sigma.
• Design for manufacture – external standards (BSI, IEE), optimum use of materials, , scale of production.
• Environmental factors – sustainability issues, energy conservation, and energy costs related to products.
• Application of standards – BSI and ISO, Health and Safety legislation.
• Stages of a product life cycle – the 4 P’s (product, price, place an promotion) – and how the digital world affects the 4 P’s.</td><td rowspan="3" colspan="2">• Deadline for NEA marks – May 1st.
• External moderation – 2nd week in May.</td></tr>
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</table>

Frequently asked questions

Question	Answer
What is the split in the qualification for the exam and coursework components?	50% for each unit (Exam and Non-exam assessment). The AS course makes up 40 % of the full A level course.
Will there be any resources available?	We are currently working on resources, such as information on materials and processes, plus quizzes for learners. This information will be published on the WJEC website ready for first teaching of the new specification.
Does WJEC provide a scheme of work for delivering the new specifications?	We will provide a basic guide to schemes of work but it will be up to centres to apply to their own timetable structure.
Can a student just do the AS course in Design and Technology?	Yes the learner can cash-in his grade at the end of the AS year.
How is the exam structured?	A mix of short answer structured and extended writing questions. All questions are compulsory.
Weighting of questions?	There will be weighted questions. e.g. 1 mark, 2 mark, 4 mark, 6 marks questions etc.
Forms of questions.	The learner will be expected to use write formal structured answers, use diagrams to support answers, complete diagrams etc.
How many Assessment criteria are the marks split into?	5 Assessment criteria: - Identifying and investigating design possibilities (10 marks) - Developing a design brief and specification (10 marks) - Generating and developing design ideas (30 marks) - Manufacturing a prototype (30 marks) - Analysing and evaluating design decisions and prototypes (20 marks)
Will there be a prescribed workbook or format to the design and make units for learners to work on?	There is no prescribed workbook. Learners are to use a formal portfolio and an informal sketchbook. This will be to encourage an iterative approach to design and development of their work.
What should be included within the sketchbook and portfolio?	The iterative process is essential to NEA. It anticipated that centres will be providing evidence on: Reviewing contextual challenges, reviewing primary/secondary research, suggested design briefs, final design brief, testing, initial design ideas, refine and development of ideas, prototyping, evaluative decision making, high quality 2D/3D images of proposals, planning/ timelines, modifications and evaluations, final prototype of finished product etc. Worth noting that when we moderate

	will expect to see everything that learner has used in the development of the design make product.
Can the portfolio be purely digital?	Yes, the portfolio can be entirely digital. If this is appropriate for the work undertaken and enables the learner to fully and successfully address all aspects of the Assessment Objectives and marking criteria. Drawings can be included, for example, through the use of a stylus and graphics tablet or by simply scanning hand drawn sketches. There must though be evidence of a range of design strategies within the e-portfolio.
Will there be set briefs?	Centres are encouraged to let the learner decide upon their own design brief. Teacher can advise the learners if he or she is doing a design and make project that is over challenging and unable to be completed in the time allocation.
How will the design and make units be assessed?	Internally marked and externally moderated. A moderator from WJEC will visit the centre and look at the sample generated by the online mark input system. Verbal feedback will be provided (marks will not be discussed) as well as a written report made available on results day.
What paper size should be used?	We are suggesting to you that A4 or A3 paper size should be used.
Are teachers able to give guidance?	Essential at the start of the NEA, to ensure that the learner does not set a problem that is unachievable in the time limit. You may support the learner through the process but the key word is 'guidance'.
Can work be taken home?	Yes. This though does come with a health warning if the learner loses work then it will have to be done again.
Are writing frames allowed?	No. You may produce a named bordered sheet for the learner but that is basically it. As soon as you add in framed boxes onto pages that is classified as leading the learner, which is not allowed.
Can a specific making process be done by an outside company?	Where a specific making process needs to be done outside of school or college, a declaration of the work completed will need to be submitted with the work and also reflected within the marking. Refer to pages 31 - 34 of the specification.
Can practical work be done at home?	All practical work should be completed within the school or college under the guidance or supervision of the teacher. The final prototype should be completed within the school or college and not be allowed to be taken home at any point.