GCSE

WJEC GCSE 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 GCSE 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 GCSE Qualifications which set out the requirements for all new or revised GCSE specifications developed to be taught in Wales from September 2017. Additionally, the specification meets the requirements of the Approval Criteria for GCSE 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 GCSE Design and Technology
- opportunities to become an examiner or moderator for the new specification
- visiting moderation.

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

Jason Cates	designandtechnology@wjec.co.uk	029 2240 4303 (Subject Officer)
Jodie Mearing-Lane	designandtechnology@wjec.co.uk	029 2240 4303 (Subject Support Officer)

Subject page: http://www.wjec.co.uk/qualifications/design-and-technology/r-design-and-technology-gcse-from-2017/

Continuing Professional Development

CPD will be delivered to assist in explaining the WJEC GCSE 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

The WJEC GCSE specification in GCSE Design and Technology provides opportunities for learners to follow a course that is, inspiring, rigorous, coherent and balanced.

The specification will enable learners to:

- Develop an appreciation of the importance of creativity and innovation to good design practice
- Actively engage in the processes of design and technology to develop as effective and independent learners
- Understand the key principles of designing and making
- Use their knowledge, skills and understanding to make design decisions in order to make a quality prototype
- Analyse existing products and produce practical solutions to meet needs, wants and opportunities while recognising their impact on quality of life
- Critically analyse links between the principles of good design, existing solutions and technological knowledge
- Understand the underlying technical principles of design and technology within their chosen focus area, with emphasis on emerging technologies, materials and practices.

This specification also gives learners an opportunity to produce extended written responses and demonstrate the quality of their written communication, including appropriate use of punctuation and grammar.

The learners will also have the opportunity to produce an extended piece of design work based on contextual challenges where they will be expected to be creative, innovative and solve problems that they have realised themselves and use the iterative design process to make real products that solve real problems identified by themselves.

www.wjec.co.uk

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 subject content which is typically taught at Key Stage 3 and provides a suitable foundation for the study of design and technology at either AS or A level. 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 which is part of the Welsh Advanced Baccalaureate Certificate:

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

Welsh perspective

In this specification, learners must 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.
For example:

Fashion and Textiles: reference to woollen mills still operational in Wales.

Melin Tregwynt, Pembrokeshire for example, is a successful traditional woollen mill; family owned and run over several generations. A case study of this company offers opportunities to look at the source of fibres, the processes of spinning and weaving, scales of production, globalisation and the carbon footprint of products which would cover several points within the specification including the Welsh perspective. Points to consider:

- The source of materials (natural) used to make their woollen products – initially locally sourced before the decline in the woollen industry of Wales.
- The processing of the raw wool into yarn; weaving yarns into cloth; scales of production. Consider a school visit to the factory to reinforce learning and understanding. The company has video clips on their website to support learning. www.melintregwynt.co.uk
- A decline in the woollen industry in Wales meant that materials had to be sourced elsewhere. In a global market wool is sourced worldwide for example: lamb's wool used in their products comes from Australia and New Zealand.
- Made in Wales. More recently the Cambrian wool initiative has begun to reverse this trend with the intention that the wool will be sourced locally: reduction in the carbon footprint; export of products made in Wales to an International market.

The specification at a glance

The subject content for Design and Technology is basically split into two parts:

- Knowledge and understanding - core and in-depth
- Designing and making – core and in-depth.

Core	In-depth
Core knowledge and understanding is presented in six distinct topic areas: • impact of new and emerging technologies • evaluation of new and emerging technologies • energy • modern and smart materials • ecological and social footprint • investigating and analysing the work of others	In-depth knowledge and understanding for **one** of the three endorsed areas: • engineering design • fashion and textiles • product design
The core skills that learners are required to develop and apply are presented in nine topic areas: • understanding design and technology practice takes place within contexts • identifying and understanding user needs • writing a design brief and specifications • investigating challenges • developing ideas • using design strategies • communicating design ideas • developing a prototype • making decisions	In-depth skills for **one** of: • engineering design • fashion and textiles • product design Presented in four distinct topic areas: • selecting and working with materials and components • marking out • using specialist techniques and processes • using surface treatments and finishes

All topics within the core knowledge and understanding and the in-depth knowledge and understanding must be addressed.
All topics within the core skills and the in-depth skills must be addressed.
Centres are not restricted in how they will deliver this course to the learner but it is anticipated that there will be an integrated approach.

Course overview

GCSE Design and Technology

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

Written Examination: 2 hours

50% of qualification

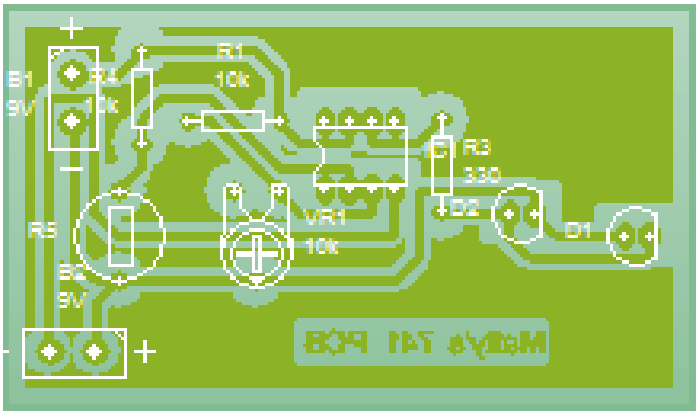
100 marks in total

A mix of short answer, structured and extended writing questions.

There are no optional questions in the examination. 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. However, extra lined pages are provided within the question paper, and further continuation booklets will be provided for learners if necessary.

Sample question

The picture below shows the layout for a printed circuit board (PCB). It has been drawn using computer aided design (CAD).



(a) Explain **one** advantage of using CAD to produce the layout for the PCB. [2]

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Exemplar Response: Using CAD would be beneficial because the designer could save files electronically, edit, develop, modify and improve versions of the PCB at any time and at any location. 2 marks

The question is specifically looking for one advantage and is worth 2 marks. Marks will be awarded one for a correct advantage and one mark for a correct explanation. This question is NOT a 2 x [1] mark question, so learners offering 2 different advantages will not be awarded with 2 marks. There must be a response which is sufficient in detail to explain one suitable advantage.

(b) Computer Numerical Control (CNC) machinery is often used to place components onto printed circuit boards (PCBs) when they are being produced in large quantities.

Describe **two** advantages of using CNC machinery for this purpose. 2 x [2]

Advantage 1: .....

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Exemplar Response: CNC machines can work quickly and efficiently placing many components accurately and without error when compared to human workers on manual production lines. 2 Marks.

Advantage 2: .....

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The question is specifically looking for two advantages each worth 2 marks. One mark will be awarded for a correct advantage and one mark for a more detailed description explaining or illustrating the advantage when manufacturing large quantities. There must be two different advantages and two different descriptions. Words in isolation like: quicker, faster, easier, better, cheaper, more accurate etc are not worthy of a mark because they do not relate to an advantage, and they are unqualified. 'Quicker than manual workers' deserves 1 mark because there is more depth to the response and the comparison of the advantage against another alternative is evident.

(c) Global manufacturing companies often design PCBs in one country and manufacture them in another.

Explain the ethical factors that these companies have to consider when choosing to manufacture in another country. [4]

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Exemplar Response: Global manufacturing is where a product is made in one country that is a third world country. This is done because the PCB manufacturing makes it cheaper. 0 Marks.

The answer must clearly indicate an understanding of ethical factors in global production. We are then looking for some explanation from the learner to verify their understanding.

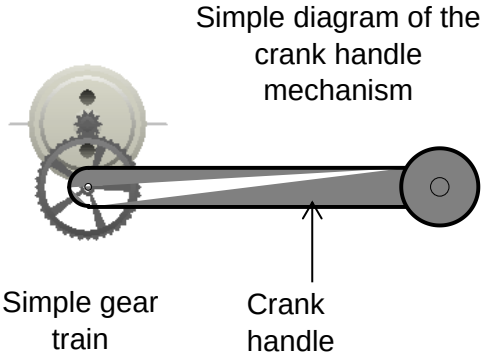
Global manufacturers need to consider the welfare of workers in their overseas manufacturing facilities e.g. working conditions/hours/safe working practices. Global manufacturers need to consider the environmental impact of their facilities on the local area. In addition to this, global manufacturing can often enlarge the footprint of a product as a result of shipping components/parts from one location to another. This creates further moral and ethical issues; Fair Trade could be included in responses where learners typify positive features of global/overseas production issues.

If a learner submits a correct answer that is not in the marking scheme the examiner can still award the marks appropriately.

Sample question

The image below is of a hand held wind up torch. It has a crank handle that is turned when the torch needs charging up.

© lauradyoung / getty images



(a) Analyse how anthropometric data would have been used by the designer and how the designer has addressed the important issue of ergonomics. [10]

Marks will be awarded for the content of the answer and the quality of written communication.

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Note: There are approximately 12 dotted lines in the actual question for the written answer refer to SAMS for style.

'Analyse' is a more demanding type of question for the learner to answer and in this case the examiner will also be checking the quality of written communication. Within the body of the answer it must be clearly evident that the learner has an understanding of anthropometrics and ergonomics. The examiner will use a banded mark scheme to assess the quality of the answer.

Exemplar response 1:

Anthropometric data involves the use of mathematical measurements of the human body to ensure that products interact with users effectively. Ergonomic principles ensure that the size of the nylon carrying strap is the correct length to fit over the user's hand or fist and sit on their wrist comfortably. The handle of the torch has got rubberised and moulded finger grooves for grip, so that the user can hold and point the torch comfortable and with control. The grooves will be the correct diameter to fit the intended user's fingers for right and left handed preferences. The crank handle needs to be turning through an appropriate diameter so that the user can comfortably rotate the arm to power the torch. The cap at the end of the crank handle will need to be loosely pivoted so that the user can avoid blisters when repeatedly rotating the crank handle. Ergonomic consideration must also be given to the lens, so that users are able to unscrew the lens cap to replace the bulb if required.

The response above deserves 10 marks. Analysis is clear and detailed and closely related to named parts of the torch. The terms anthropometrics and ergonomics are clearly understood. QWC is excellent.

Exemplar response 2:

The shape and size of ports of the torch have to be the right size for user to be able to use the torch correctlly. The handle of the torch has to fit the users hand and the strap has to go over the user's wrist.

This response is far shorter, with much less depth. There is no link to the terms anthropometrics or ergonomics, and the learner has not defined these terms using the torch as the focus. There is some credit awarded because the learner has identified the importance of how the user interacts with the product and named specific parts that are related to ergonomics and anthropometrics. There are some grammar and spelling issues. This response is in the lowest category deserving 2 marks.

Incorrect/no answer.	**0**
Brief analysis with little detail of anthropometric data or ergonomic issues. Quality of Written Communication is limited, presenting material with limited coherence, many grammatical, punctuation and spelling errors.	**1 - 2**
More detailed analysis, with some explanation of required anthropometric data and ergonomic issues. 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 anthropometric data required and relevant ergonomic issue evident. 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 anthropometric data required and relevant ergonomic issues evident. 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**

Unit 2 – Design and make task – Engineering Design

NEA (Non Exam Assessment) – 50% of the qualification

Approximately 35 hours

Design and make task from a contextual challenge set by WJEC

Worth 100 raw marks

Apply the iterative process of designing

The assessment criteria for the NEA are generic, learners who focus on engineering design are more likely to undertake work which reinforces the knowledge and understanding tested in the examination paper.

NEA: A sustained design and make task, based on a contextual challenge set by WJEC, 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 a visiting moderator.

Requirements

Three contextual challenges available June 1st in the year preceding the year in which the qualification is awarded. Learners will choose to tackle **one** challenge. From the challenge the learner will investigate and decide upon possible problems/issues before deciding on a possible design task to tackle.

There will be NO SET PAGE FORMAT for the NEA.

Suggested structure of evidence required

Informal A4/A3 sketchbook

This will clearly:

- *Identify design possibilities*
- *Generate and develop design ideas.*

Note: Centres do not need to purchase an A4/A3 sketchbook and this does not have to be a bound book. It could simply be a series of A3 pages stapled together, or it could be a series of A3 and A4 pages loosely bound together with a treasury tag for example. How exactly the work is presented is up to the individual centre. However, it is important to track the work and record clearly where marks have been awarded against the marking criteria.

Formal presentation A3 portfolio to 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*

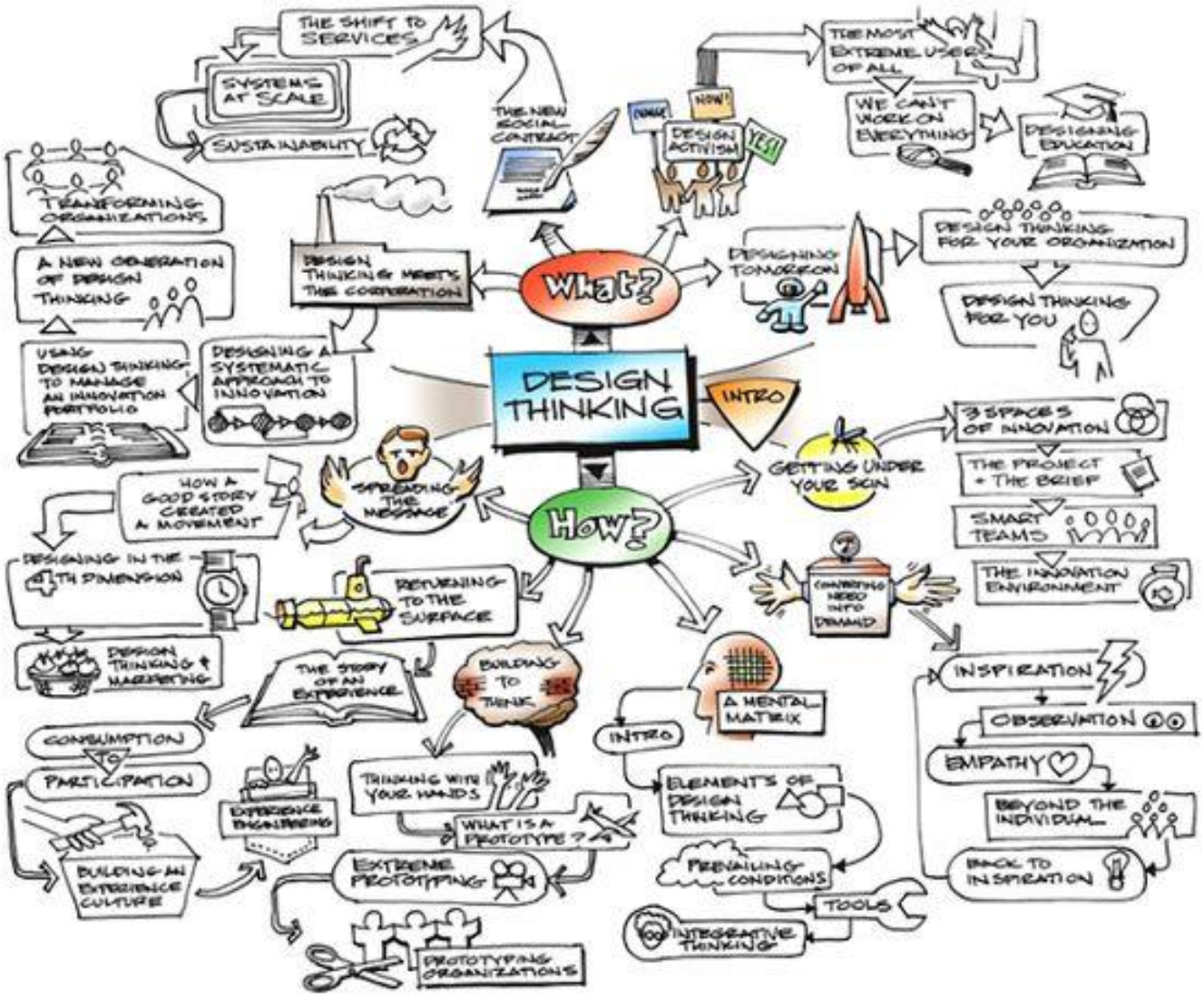
Make/practical outcomes

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

Assessment criteria for the design and make contextual challenge.

Note: You do need to clearly indicate the learner's name and the centre name and number

Assessment Criteria		Marks	Assessment objective	Guidance
(a)	***Identifying design possibilities.***	10	AO1	• *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	AO2	
(d)	Making a prototype.	30		
(e)	Evaluating a prototype's fitness for purpose.	20	AO3	
	Total	100		



A brainstorm might be the starting point for some learners to gather their thoughts about the context. It is a good opportunity to explore the divergent possibilities within the context, and also generate important areas for further investigation/research. Mind maps or brainstorms can allow learners to record potential ideas, questions and tasks that can be extended at a later date, developed further during the iterative design process, or parked and not revisited.

Provide details of the **Target Market** for your product.

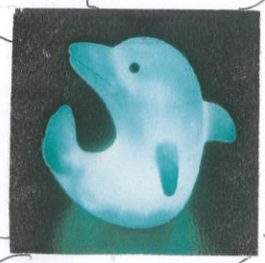
For my product I will need to know who my target market are, so I did some research. I will be making my product for both genders at the ages 18 months to 3 years old. Children that age will like colours and things that light up so I will have to include that. My product will have to be light to be used by children, it must be safe also. The parents will also be my target market so I will have to consider their financial status, I will have to make my product wall mounted, able to stand and to be carried around. I will make it automaticly powered so the parents dont have to knock it on and off.

This item comes in bubble wrap, and a box so the item doesn't get damaged.

This item is lightweight, this ables children and adults to carry it around the room with no hassle.

Materials

This product is made out of acrylic. Its opaque to let the light through



Target Market

The target market would be for children ages 18 months to 3 years, this is because they will be moving from their parent bed to their own.

Safety

Its not got any sharp ends, and it's been marked with a bsi and a CE mark. Able to use in Britain and europe.

Colours.

It is blue, this could be because the Product is a dolphin or it could be aimed at boys.

Size

This item is a small size but not to small and not to large. It is the perfect size to hold in your hand.

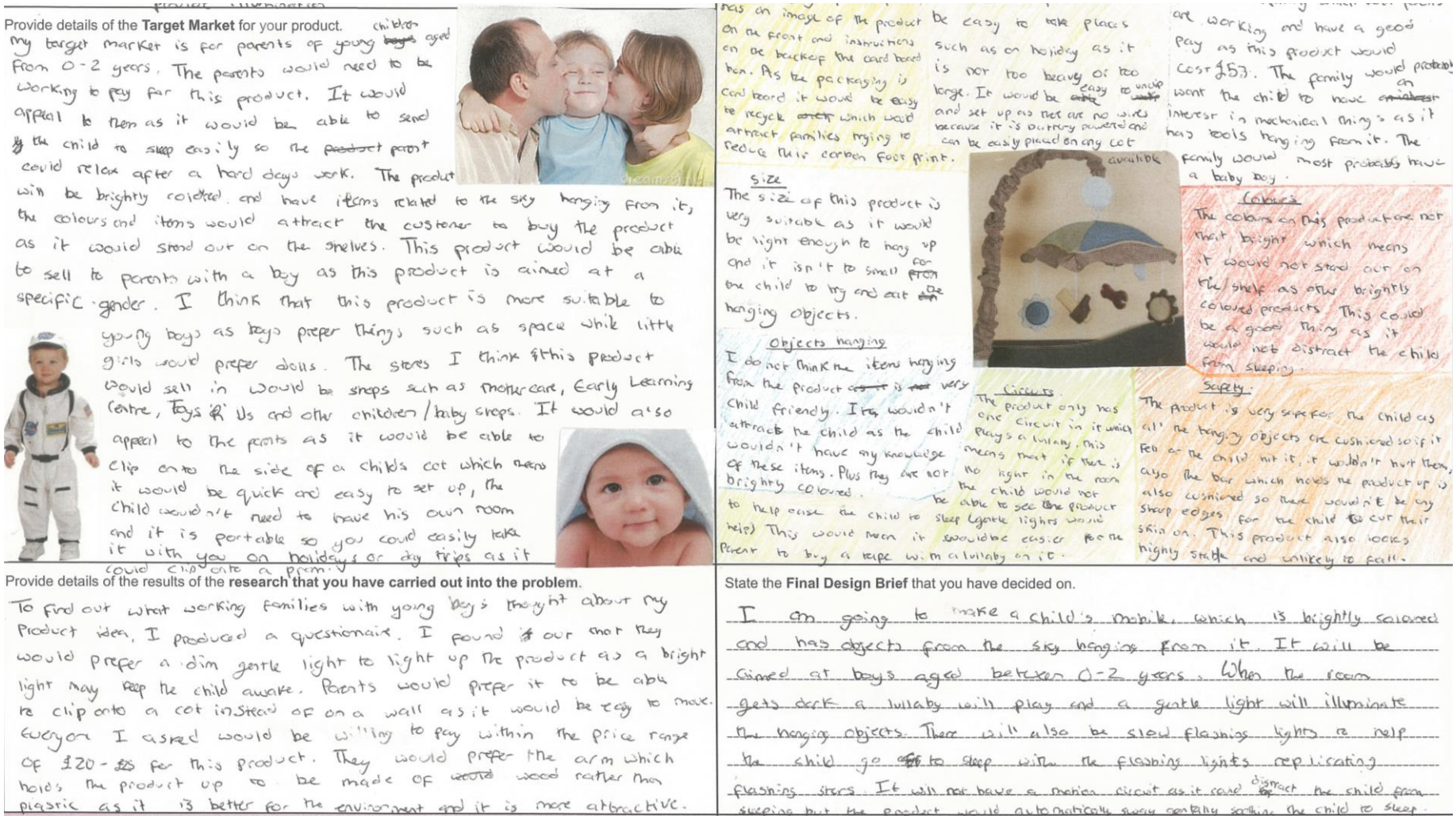
Provide details of the results of the **Research** that you have carried out into the problem.

I have asked family and friends with their children if they would like a nightlight for their child or not, 40% said no and 60% said yes. I asked the 60% what an ideal nightlight would be and they replied with the answers, lightweight, able to be used by children, freestanding and colourful. They also want it to be safe to hook up on the wall.

State your **Final Design Brief** here.

I will be making and designing a childrens nightlight that is colourful, battery operated, automatic to light up and off, freestanding, able to hook on the wall and able to use by children. I will also negotiate with parents economic status.

Evidence of critical analysis of users' needs and wants, with investigation into the problem. Target market is considered and the problem is understood fully.



Provide details of the **Target Market** for your product.

My target market is for parents of young children aged From 0-2 years. The parents would need to be working to pay for this product. It would appeal to them as it would be able to send the child to sleep easily so the parent could relax after a hard days work. The product will be brightly coloured and have items related to the sky hanging from it, the colours and items would attract the customer to buy the product as it would stand out on the shelves. This product would be able to sell to parents with a boy as this product is aimed at a specific gender. I think that this product is more suitable to young boys as boys prefer things such as space while little girls would prefer dolls. The stores I think this product would sell in would be shops such as mothercare, Early Learning Centre, Toys R Us and other children / baby shops. It would also appeal to the parents as it would be able to clip onto the side of a childs cot which means it would be quick and easy to set up, the child wouldn't need to have his own room and it is portable so you could easily take it with you on holidays or day trips as it could clip onto a pram.

Provide details of the results of the **research that you have carried out into the problem.**

To find out what working families with young boys thought about my product idea, I produced a questionaire. I found out that they would prefer a dim gentle light to light up the product as a bright light may keep the child awake. Parents would prefer it to be able to clip onto a cot instead of on a wall as it would be easy to move. Everyone I asked would be willing to pay within the price range of £20-£25 for this product. They would prefer the arm which holds the product up to be made of wood rather than plastic as it is better for the environment and it is more attractive.

has an image of the product on the front and instructions on the back of the card board box. As the packaging is card board it would be easy to recycle which would attract families trying to reduce their carbon foot print.

be easy to take places such as on holiday as it is not too heavy or too large. It would be easy to and set up as there are no wires because it is battery powered and can be easily placed on any cot

are working and have a good pay as this product would cost £53. The family would want the child to have an interest in mechanical things as it has tools hanging from it. The family would most probably have a baby boy.

Size

The size of this product is very suitable as it would be light enough to hang up and it isn't to small for the child to try and eat the hanging objects.

Colours

The colours on this product are not that bright which means it would not stand out on the shelf as other brightly coloured products. This could be a good thing as it would not distract the child from sleeping.

Objects hanging

I do not think the items hanging from the product is very child friendly. It wouldn't attract the child as the child wouldn't have any knowledge of these items. Plus they are not brighty coloured to help ease the child to sleep (gentle lights would help) This would mean it would be easier for the parent to buy a teape with a lullaby on it.

Circuits

The product only has one circuit in it which plays a lullaby. This means that if there is no light in the room the child would not be able to see the product (gentle lights would help) This would mean it would be easier for the parent to buy a teape with a lullaby on it.

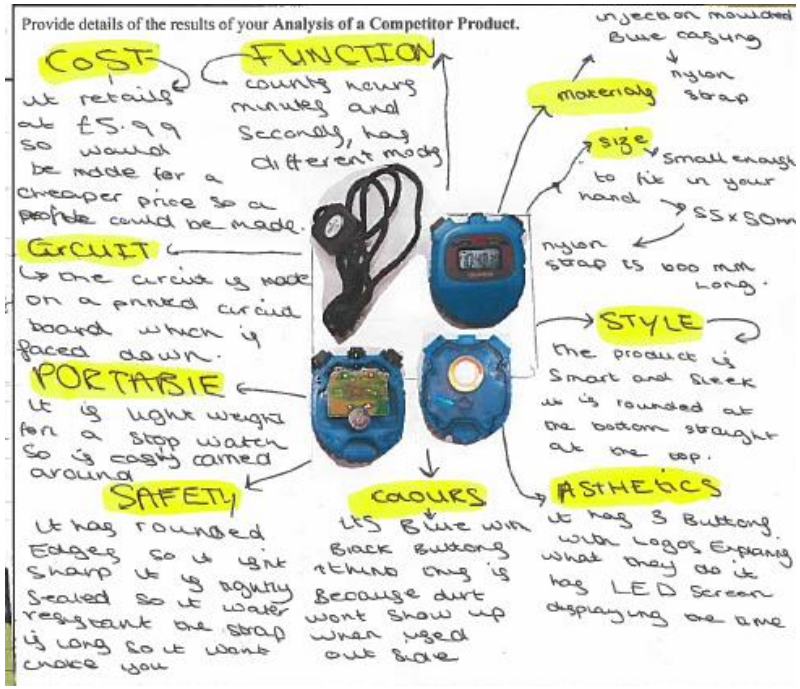
Safety

The product is very safe for the child as all the hanging objects are cushioned so if it fell on the child hit it, it wouldn't hurt them, also the bar which holds the product up is also cushioned so there wouldn't be any sharp edges for the child to cut their skin on. This product also looks highly stable and unlikely to fall.

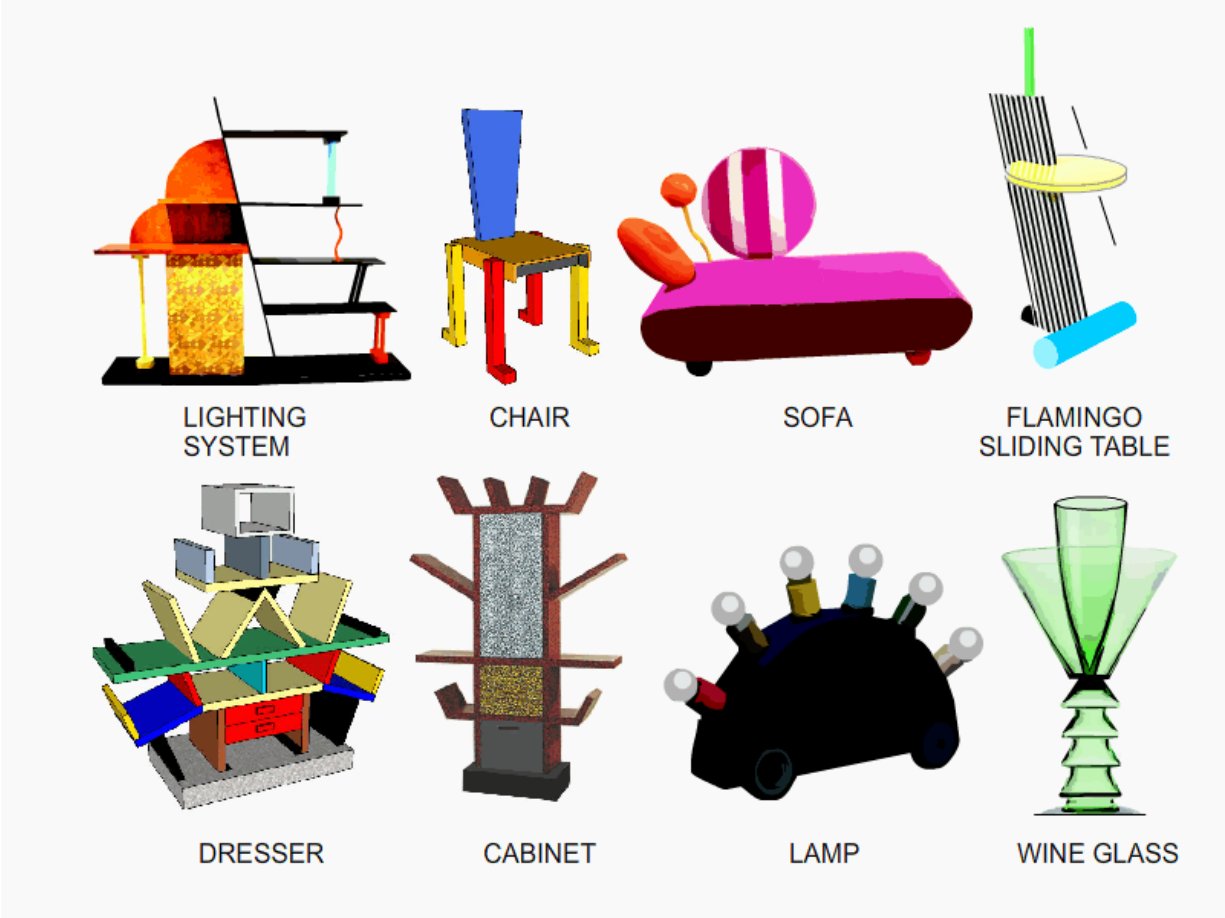
State the **Final Design Brief** that you have decided on.

I am going to make a child's mobile, which is brightly coloured and has objects from the sky hanging from it. It will be aimed at boys aged between 0-2 years. When the room gets dark a lullaby will play and a gentle light will illuminate the hanging objects. There will also be slow flashing lights to help the child go to sleep with the flashing lights replicating flashing stars. It will not have a motion circuit as it could distract the child from sleeping but the product would automatically slowly gently soothe the child to sleep.

Both pages show research into existing products, with the evaluation of features of existing designs on the market. All of the research is focussed and relevant. There is analysis of information rather than just the presentation of information. Learners are reminded that the evaluation and analysis of their research is the most important factor, not simply presenting raw research results.



Disassembling a product helps a learner see how typically similar products are manufactured and assembled. Engineering design learners should undertake this ‘below the line’ activity.



Where appropriate, the opportunity to look at other designers, manufacturers, design movements and practitioners can often bring inspiration and stimulate styles, colours, forms and textures. This research is then used to inspire learners' own designing.

Band 4 Assessment Criteria - Identifying design possibilities

- Undertaken thorough and effective identification of opportunities for the development of designs within the prescribed context.
- Undertaken detailed, relevant research and investigation, clearly linked to the context and, where appropriate, the work of past/present professionals and companies.
- Undertaken detailed and effective analysis of information, reflecting the needs, wants and values of clients or potential users.
- Identified a broad range of problems/opportunities to clearly inform the development of possible design briefs.

Learners meeting the four descriptors from Band 4 of the marking criteria deserve 9-10 marks.

Assessment Criteria		Marks	Assessment objective	Guidance
(a)	Identifying design possibilities.	10	AO1	• *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	AO2	
(d)	Making a prototype.	30		
(e)	Evaluating a prototype's fitness for purpose.	20	AO3	
	Total	100		

I will be making and designing a childrens nightlight that is colourful, battery operated, automatic to light up and off, freestanding, able to hook on the wall and able to use by children. I will also negotiate with parents economic status.

A clear final brief is presented as a result of the detailed, relevant and focussed research, following the consideration of a number of possible design tasks.

Primary

Function

1. My product must light up in the dark. To make this happen, I must use an LDR to recognise the change in light conditions, this will allow the LED's to illuminate when the room is dark. 2. My product must be free standing, and able to hook onto a wall, it must include a keyhole fitting. It must have a flat surface and be able to balance. 3. My product must be battery powered, allowing it to be portable.

Size

1. My product should be no more than 100mm length, 100mm width and 150mm height. 2. My products weight should be no more than 430g and no less than 400g.

Aesthetics

My item will look suitable for children, it will feel comfortable in the adult's and child's hand. My product will be in the shape of an elephant, it will be pale pink. I will vaccuum form it into the shape of an elephant.

Materials.

My product must be easy to clean, or to wipe down. My product must be impact resistant so no damaged is caused.

Safety

My product must be safe for the Parent and Child's use. It must have no sharp edges for injuries. It must have no small parts that can fall off or get swallowed.

Reliability.

My product must be reliable, it must work flawlessly, without having to press many buttons. It must work all night long without having to knock it on and off.

LOCATION

My product will be used in a child's or adult's bedroom. As it is battery powered, you're able to take it family camping, holidays (home + away), and to sleepovers.

Secondary.

Function.

My product could play a lullaby's, alphabet songs, it could flash lights repeatedly, It could have a toggle switch, rocker switch or a push-to-make switch. My product could dangle from the ceiling or cot. My product could have a rounded base so it could roll around, this would be enjoyable for the child.

Size.

My product size could be 100 x 100 x 150 but could have add on's like jigsaw pieces, could have a detachable handbag peice to be portable.

Aesthetics.

My product could be the shape of a cartoon character, it could be learning shapes like squares, triangles, rectangles, etc. My product could come in different letters of the alphabet for the child's initial. My product could have different numbers and colours for the child's favourite number and colour.

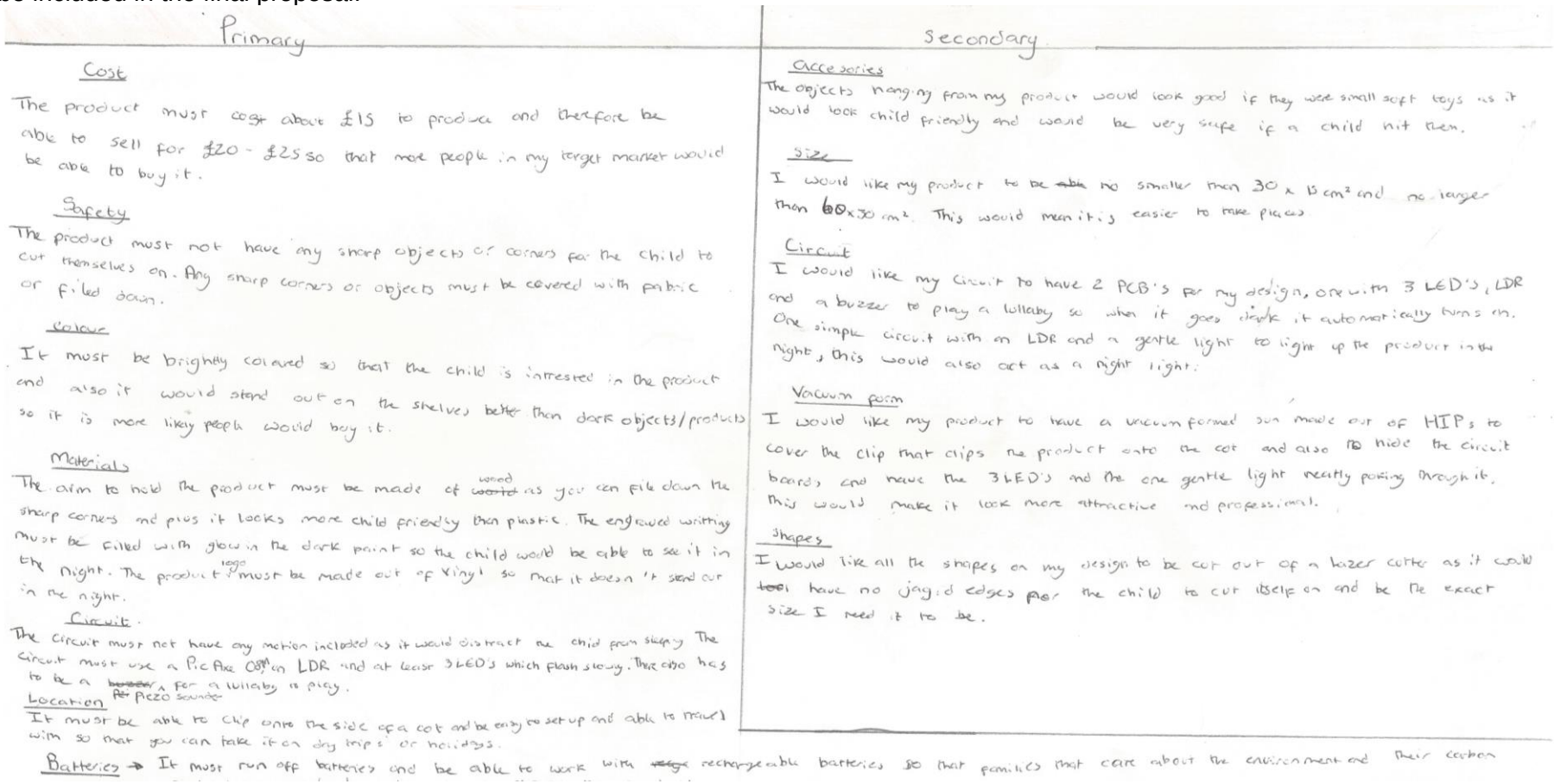
Materials.

My product could be able to draw on for daytime usage, as well as nighttime usage. My product could be able to wipe off. My product could be squishy.

Safety.

My product could be for adult use only so it's safe in the hands of an adult.

This is a detailed specification containing measurable criteria that will be used to drive designing and development. The specification must be used as a design tool, and any ideas, models, tests; initial prototypes must be evaluated against the specification criteria. There are important features used as headings with multiple statements within each heading to 'split' up the success criteria into manageable aspects. There is a hierarchy of importance and the learner has split the criteria into Primary and Secondary which clarifies what must be included and what could be included in the final proposal.



Primary

Cost

The product must cost above £15 to produce and therefore be able to sell for £20 - £25 so that more people in my target market would be able to buy it.

Safety

The product must not have any sharp objects or corners for the child to cut themselves on. Any sharp corners or objects must be covered with fabric or filed down.

Colour

It must be brightly coloured so that the child is intrested in the product and also it would stand out on the shelves better than dark objects/products so it is more likely people would buy it.

Materials

The arm to hold the product must be made of ~~wood~~ wood as you can file down the sharp corners and plus it looks more child friendly than plastic. The engraved writting must be filled with glow in the dark paint so the child would be able to see it in the night. The product's logo must be made out of Vinyl so that it doesn't stand out in the night.

Circuit

The circuit must not have any motion included as it would distract the child from sleeping. The circuit must use a PicAxe 08M on LDR and at least 3 LED's which flash slowly. There also has to be a ~~buzzer~~, for a piezo sounder for a lullaby to play.

Location

It must be able to clip onto the side of a cot and be easy to set up and able to travel with so that you can take it on day trips or holidays.

Batteries → It must run off batteries and be able to work with ~~usage~~ rechargeable batteries so that families that care about the environment and their carbon

Secondary

Accessories

The objects hanging from my product would look good if they were small soft toys as it would look child friendly and would be very safe if a child hit them.

Size

I would like my product to be ~~able~~ no smaller than 30 x 15 cm² and no larger than 60x30 cm². This would mean it is easier to make places

Circuit

I would like my circuit to have 2 PCB's for my design, one with 3 LED's, LDR and a buzzer to play a lullaby so when it goes dark it automatically turns on. One simple circuit with an LDR and a gentle light to light up the product in the night, this would also act as a night light.

Vacuum form

I would like my product to have a vacuum formed sun made out of HIP's to cover the clip that clips the product onto the cot and also to hide the circuit boards and have the 3 LED's and the one gentle light neatly poking through it. This would make it look more attractive and professional.

Shapes

I would like all the shapes on my design to be cut out of a laser cutter as it could ~~tool~~ have no jagged edges for the child to cut itself on and be the exact size I need it to be.

This specification is slightly weaker than the previous example. The criteria are less developed. The statements do not include such specific details, and therefore it will be more difficult to begin iterative designing because the content has not been pinpointed clearly. Using '...must be brightly coloured…' is not specific. There are many bright colours, learners need to name 'lime green' if that is what the needs and wants of the users require. Avoiding basic and simplistic statements is crucial, often small, safe, cheap, aesthetically pleasing are included in specification criteria, but these terms offer no meaning in isolation. Sizes need to be in measurable data form, e.g 250mm x 120mm x 30mm. Cost must include prices in numerical values e.g. must cost no more than £12.00 to manufacture in a school workshop, and the end product must have a retail price of £18.99. The development of specification criteria is critical, and will make designing, prototyping, testing and evaluating far easier to conduct.

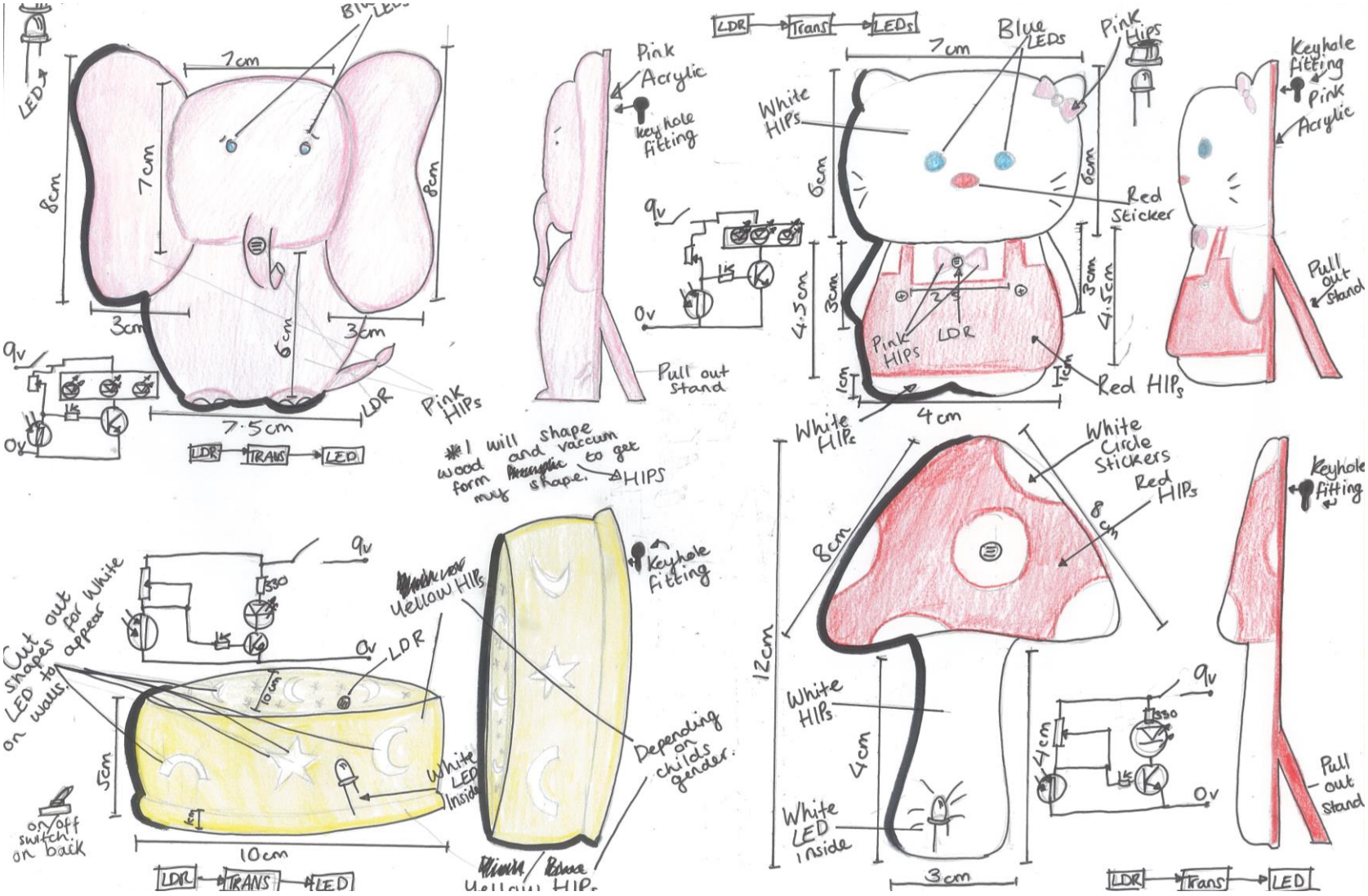
Band 4 Assessment Criteria - Developing a design brief and specification

- Fully considered a range of problems/opportunities before deciding upon a final design brief.
- Demonstrated a very good understanding of the task ahead and the requirements which have to be met, to satisfy fully the needs, wants and interests of potential users.
- Written a design brief, relevant to the context, based upon a thorough analysis of their research and investigation.
- Written a detailed, relevant specification, including a range of objective and measurable criteria, to direct and inform the design and manufacture of a prototype.

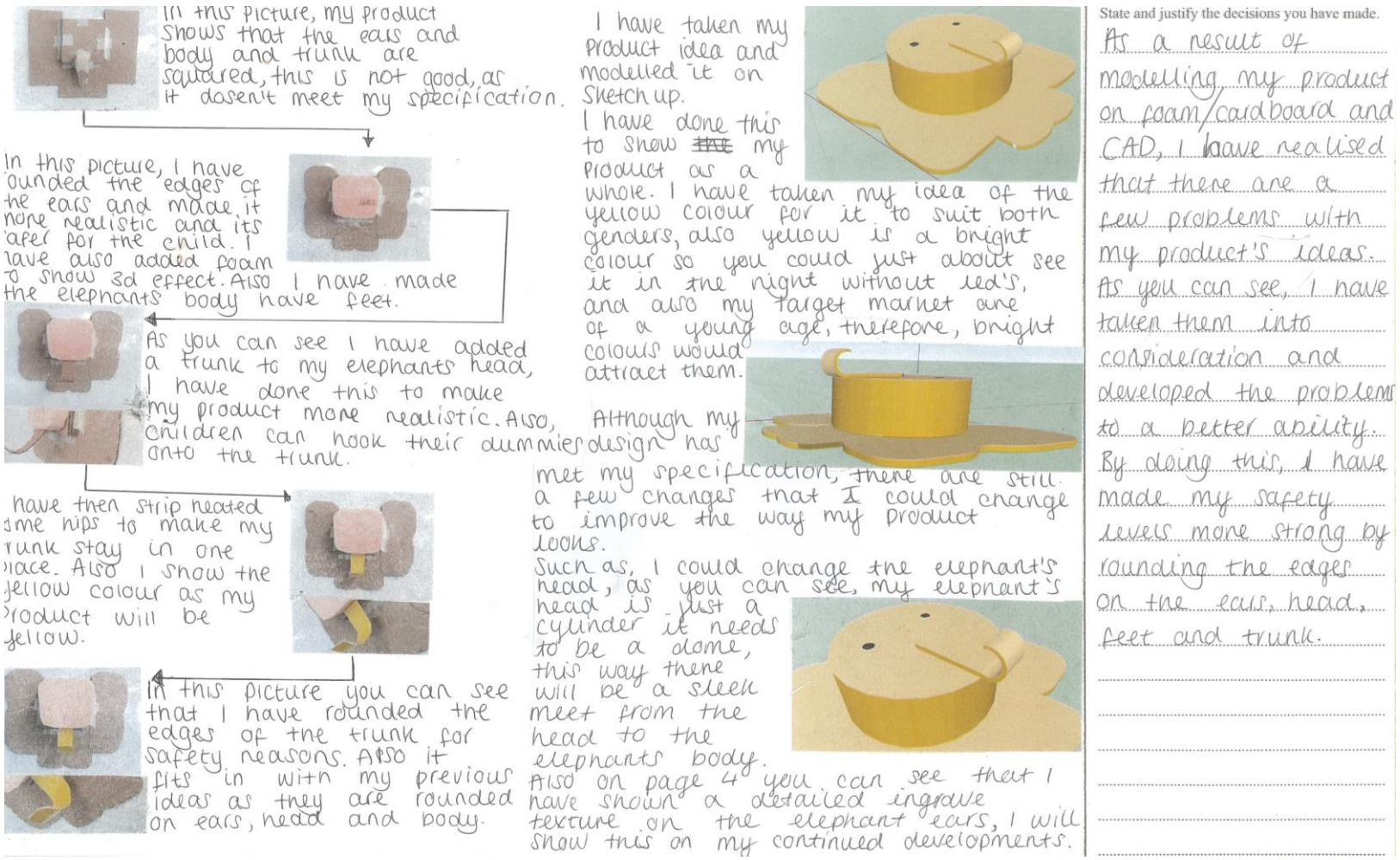
A learner who meets the descriptors above deserves to be awarded 9-10 marks in Band 4.

Assessment Criteria		Marks	Assessment objective	Guidance
(a)	Identifying design possibilities.	10	AO1	• *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	AO2	
(d)	Making a prototype.	30		
(e)	Evaluating a prototype's fitness for purposes	20	AO3	
	Total	100		

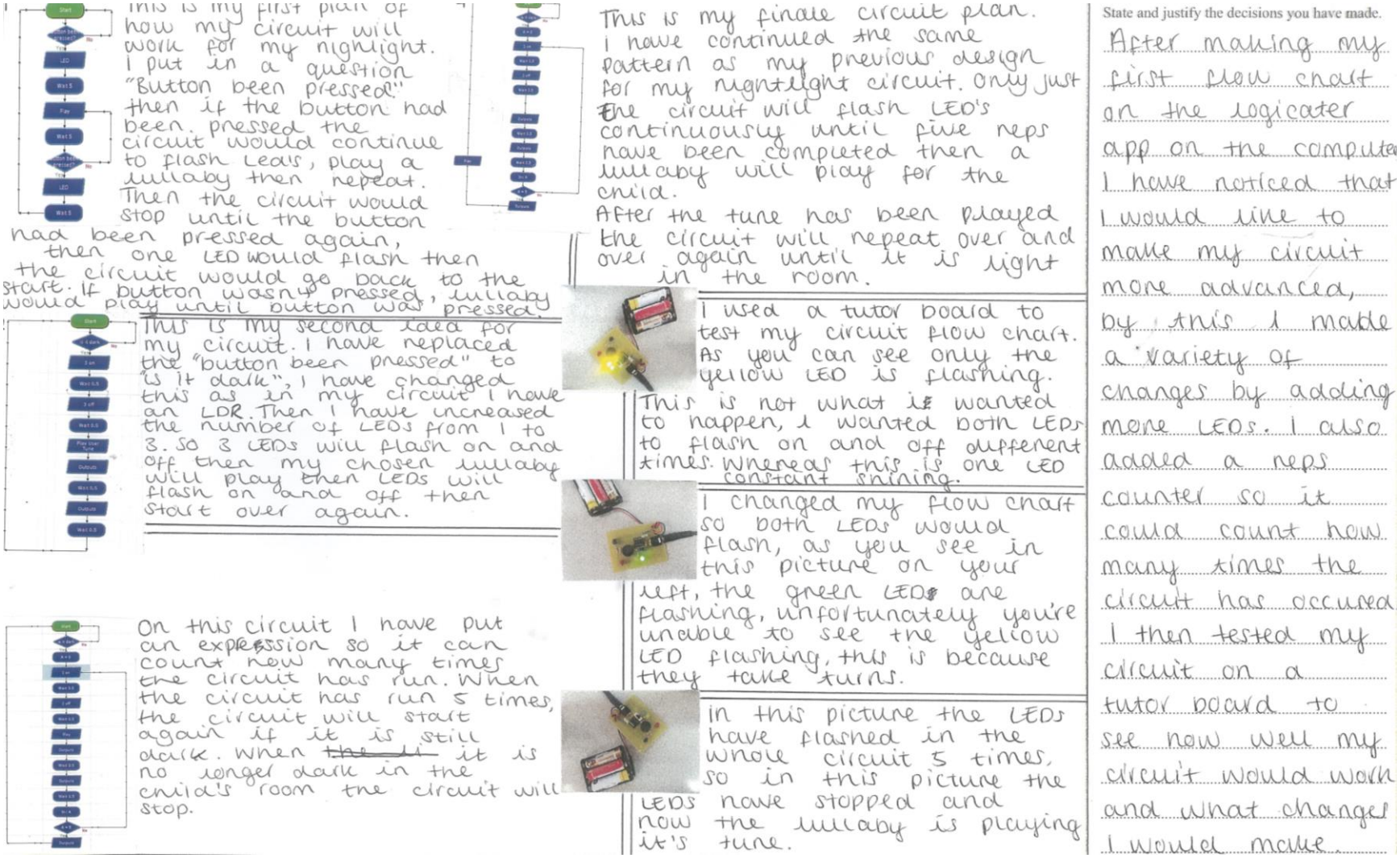
This aspect of the NEA represents a large proportion of the overall mark allocation, and there will need to be a variety of types of evidence to achieve high marks here. The iterative approach must allow learners to ‘unpick’ the problem and begin to come up with possible ideas for parts of the potential solution. There must be a clear ‘think, create, test, evaluate’ cyclic approach to the activities that learners undertake as part of their generating and developing of design ideas. This culminates in the presentation of the final prototype.



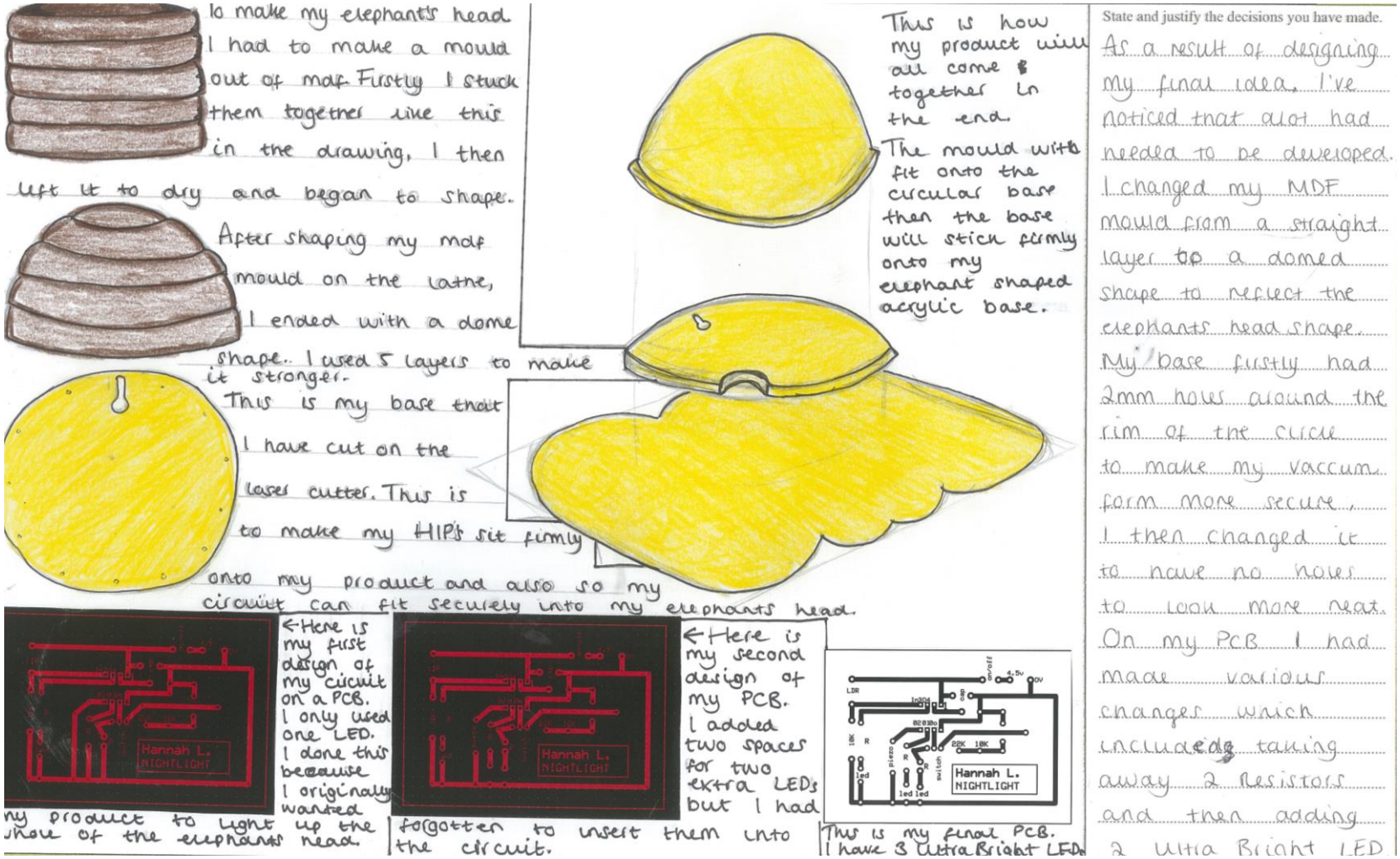
A learner could start with some initial ideas for the outcome. This might be an opportunity to think about the problem and a possible solution as a 'whole'.



Once a learner has an idea that has potential, it requires testing. Here the learner explores form, aesthetics and size issues in order to establish a further understanding of the casing issues as part of the engineering design product. There are multiple models in card, foam and HIPS which are fully evaluated against specification criteria. Refinements are made as a result of analysis, and further iterations are produced and tested. The introduction of CAD is useful here and supports the modelling, testing, analysing and refining of possible ideas.



The function of the device is being developed here. Again in an iterative style, the learner designs, models, evaluates and improves a number of possible flowcharts to control a PICAXE system for the nightlight. The learner has used a prototype pcb to run different iterations of the flowchart to test whether the device functions as specified in the specification. Detailed commentary supports decision making.



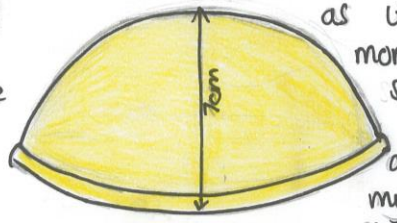
Here the learner uses CAD to develop a pcb for the PICAXE system. There are several iterations showing how the pcb is developing, analysis and decision making is evident. Analysis shows how the former will be constructed for the vacuum forming process. There are details of the base, with holes included to ensure the air is removed and the shell fits the base accurately.

Product Name	Colour	Quantity	Cost	Total
LDR	N/A	1		
Toggle Switch	Black	1	0.573	0.518
Piezo	N/A	1	0.51	0.51
Download Socket	N/A	1	0.12	0.12
Ultra Bright LED	White	3	0.42	01.26
PIC Axe 8M2	N/A	1	2.00	2.00
Capasitor	N/A	1	0.05	0.05
Resistor	N/A	6	0.01	0.06
Battery Clip	N/A	1	0.01	0.01
45 V battery	N/A	1	2.00	2.00
				£6.59

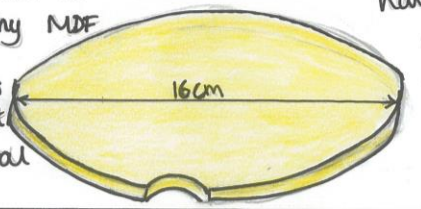
HIPS 1mm 500ml =£0.60p

MDF 15mm 150ml =£0.50p

I will need to make a mould out of MDF to vaccume form a dome case for my product.
I used a 150ml x 150ml sheet of MDF and used 5 layers which came to a total of £0.50.



During the process of making my dome out of HIPS I had to make sure it was very smooth and fit to my MDF mould.
I used a vaccume former to do this. I used a 500ml x 500ml sheet of HIPS which came to a total of £0.60



I could use 9mm thickness MDF. This would benefit me as the former wouldn't need as much layers and would not need as much materials such as glue. The cost of this would be £0.06, therefore I will do it like this.

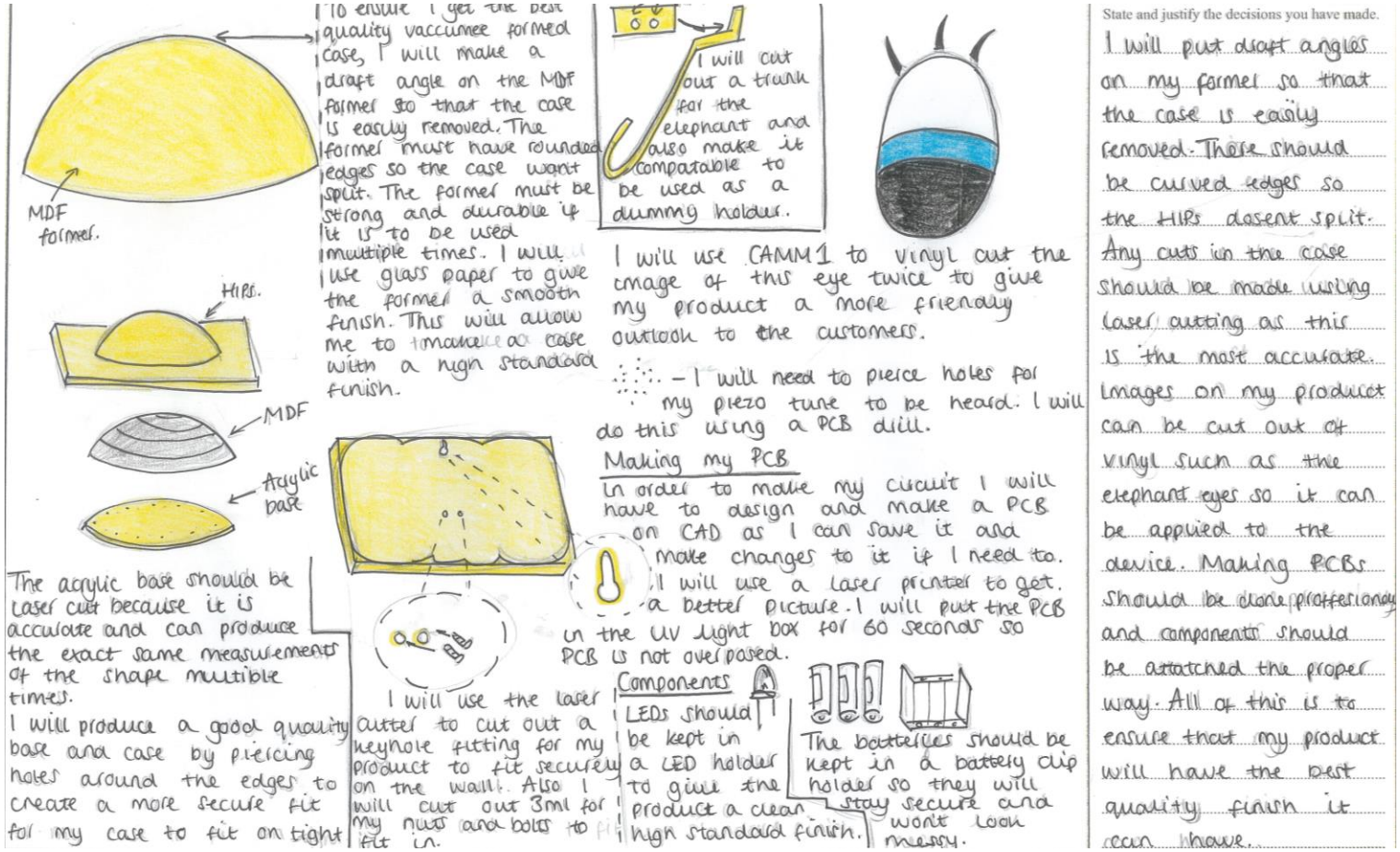
My product will need a base made of acrylic, in able to make this happen I need to make the acrylic base bigger than the MDF former, therefore, I will make the base 63mm x 63mm.

I could use 3mm thickness acrylic as it would make the product more lightweight and easy to secure to the wall.
I could use 5mm thickness acrylic as it will benefit my product making it stronger and more reliable as the customer will not have to worry about the product breaking easily on the child.

State and justify the decisions you have made.

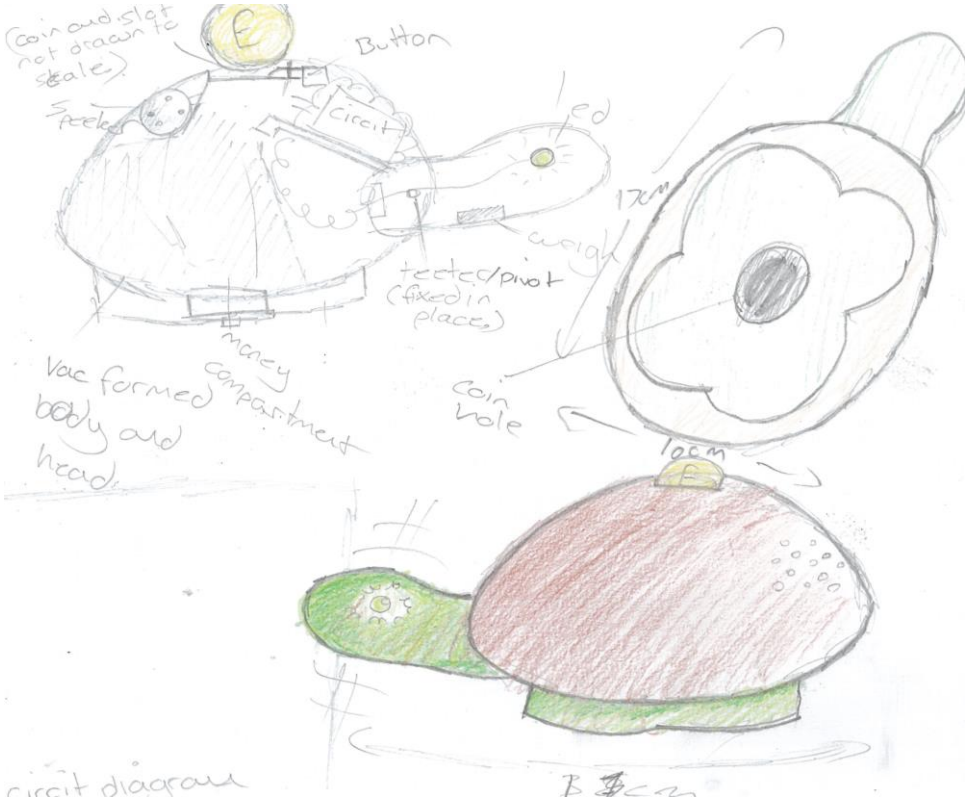
I have decided to use 9mm thickness MDF as this would reduce the cost of the product and the use of materials. I will use 3mm thickness acrylic for the base to reduce the weight of the product because it will be hung on the wall and will be easy to transport. I will use HIPS of 1mm thickness because it is a cheap yet durable material for the casing. I will use an LDR to able my circuit to start when it is dark for the child will be in bed ready to sleep. A piezo will enable the product to play a lullaby for the child.

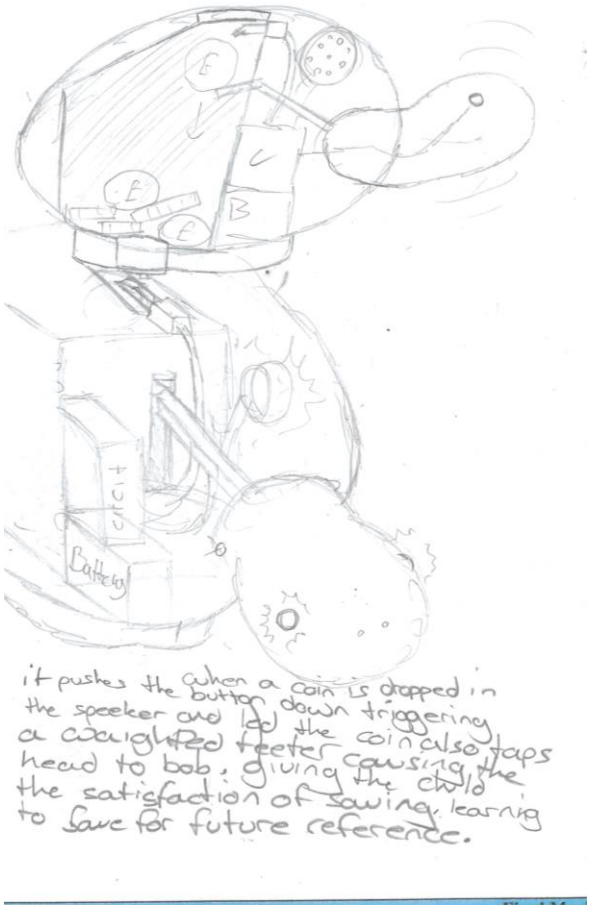
This page focusses on the construction of the product, the components required and possible costs. Size issues are considered, decisions made are clearly referenced.



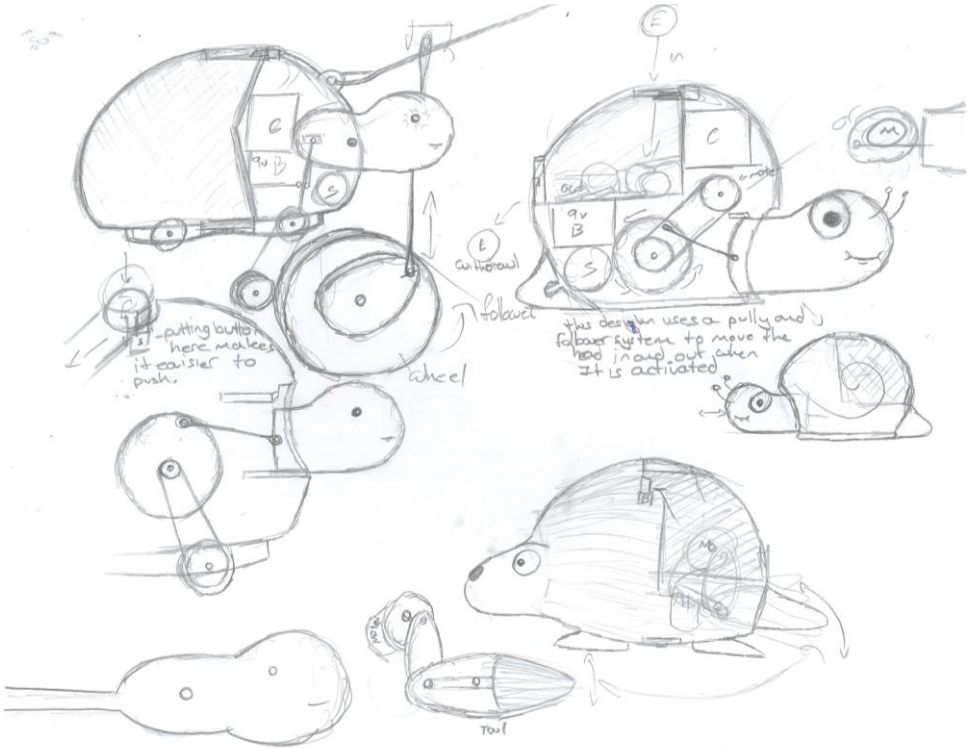
This page concentrates on construction of the shell, and how components fit together when assembled. Fine details such as battery pack holders, holes for screws, and keyhole fittings are finalised. Speaker holes are included, alongside CAMM1 vinyl details for finishing. Again, there is comprehensive analysis and decision making is evident, with detailed annotation of all design decisions.

Within the NEA a learner may interperate the contextual challenges and decide to do a mechanical design engineering form of project may focus on different content.

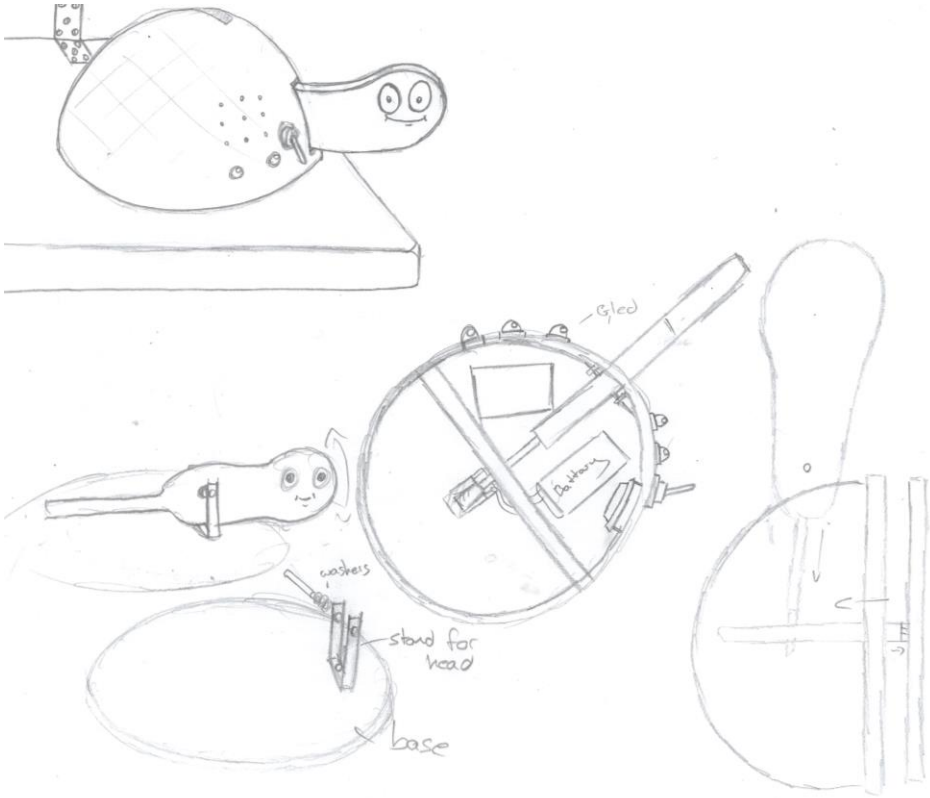




Initial design sketches for a mechanical toy money box. When a coin is placed inside the money box, the device moves forwards, with the head oscillating.

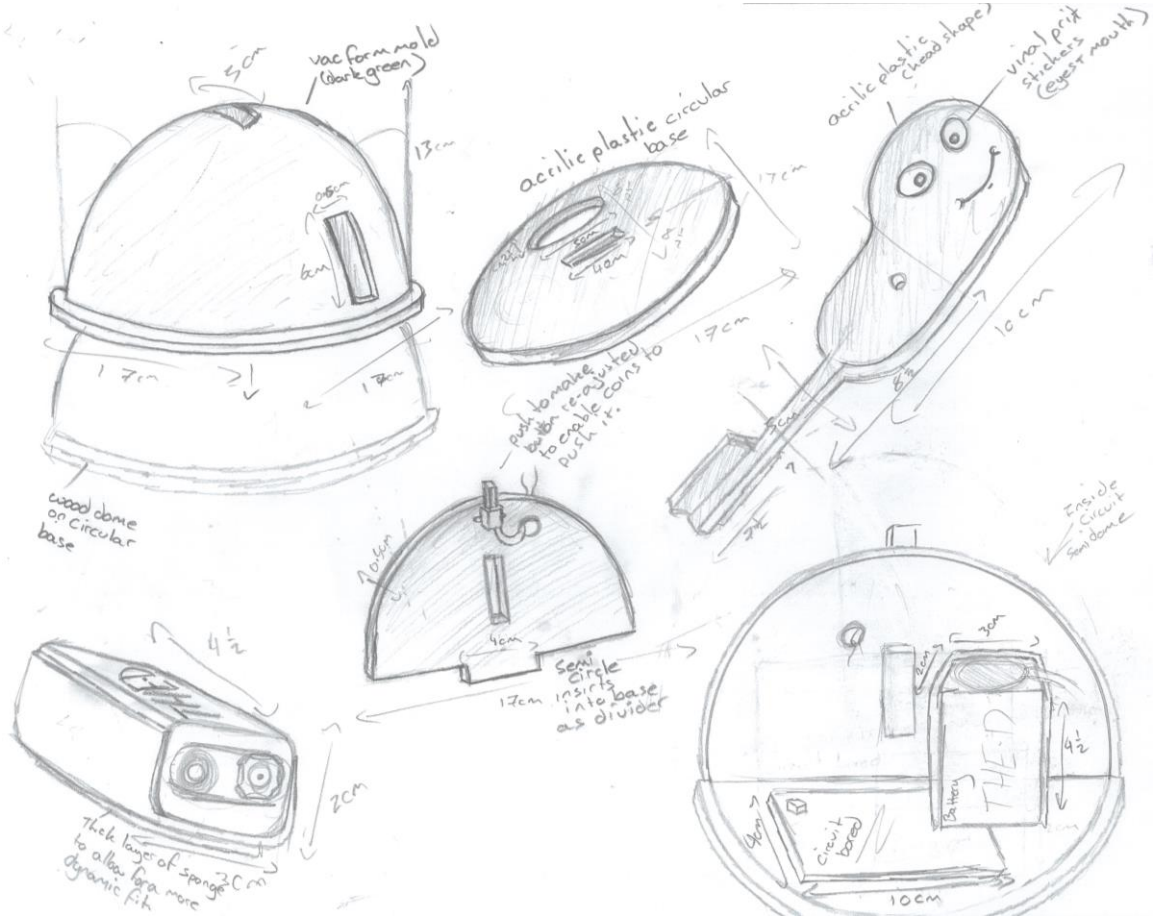


Further mechanical designs for the possible movement of the tortoise's head. Pulley systems, crank and sliders, and cam and follower mechanisms suggested, with detailed annotation and high quality sketching.



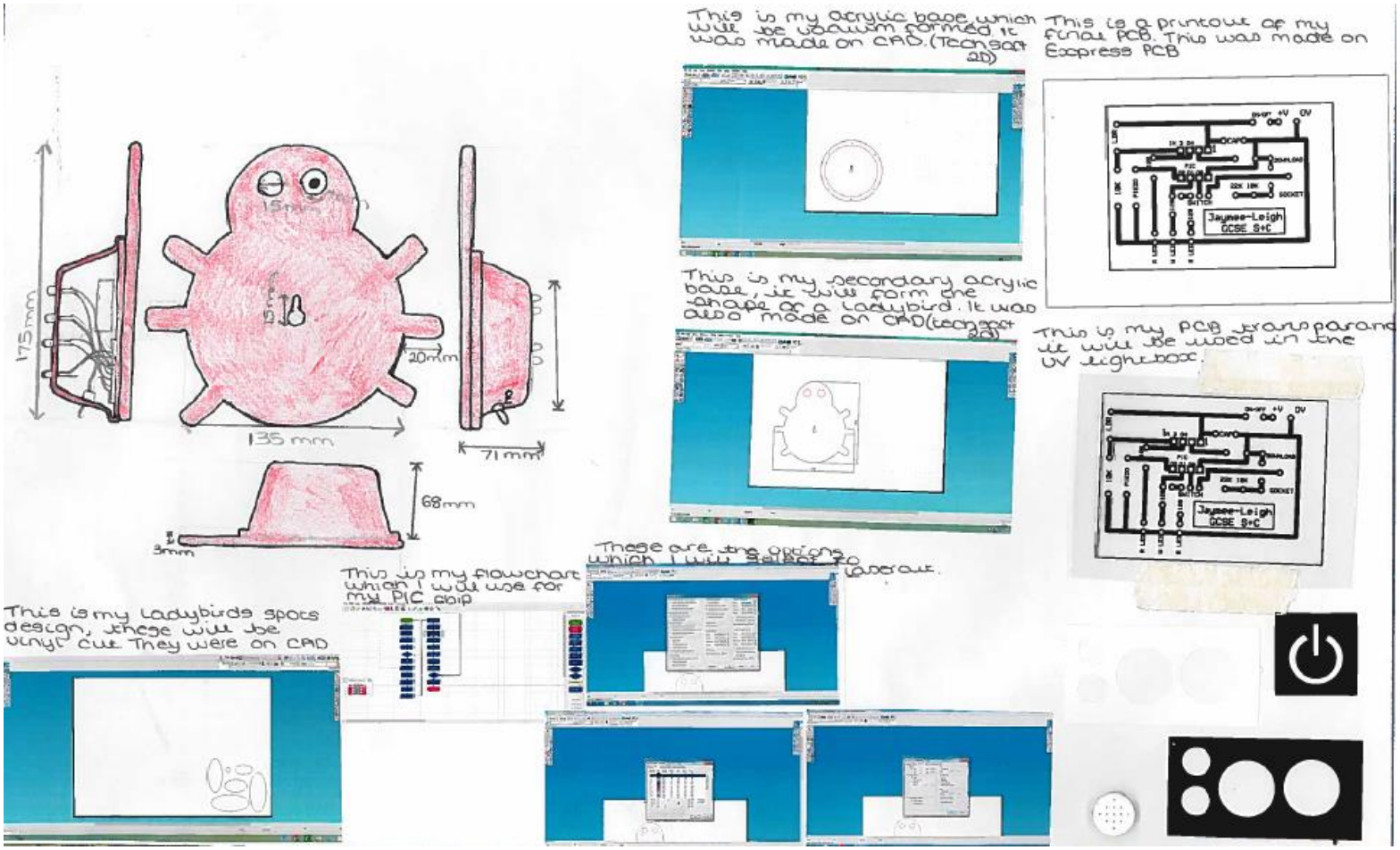
The electro-mechanical device is being developed from 'inside out' which is an effective style of iterative designing for products with internal control systems.

Battery positions, pcbs, pivot points/levers, external input components all being configured.



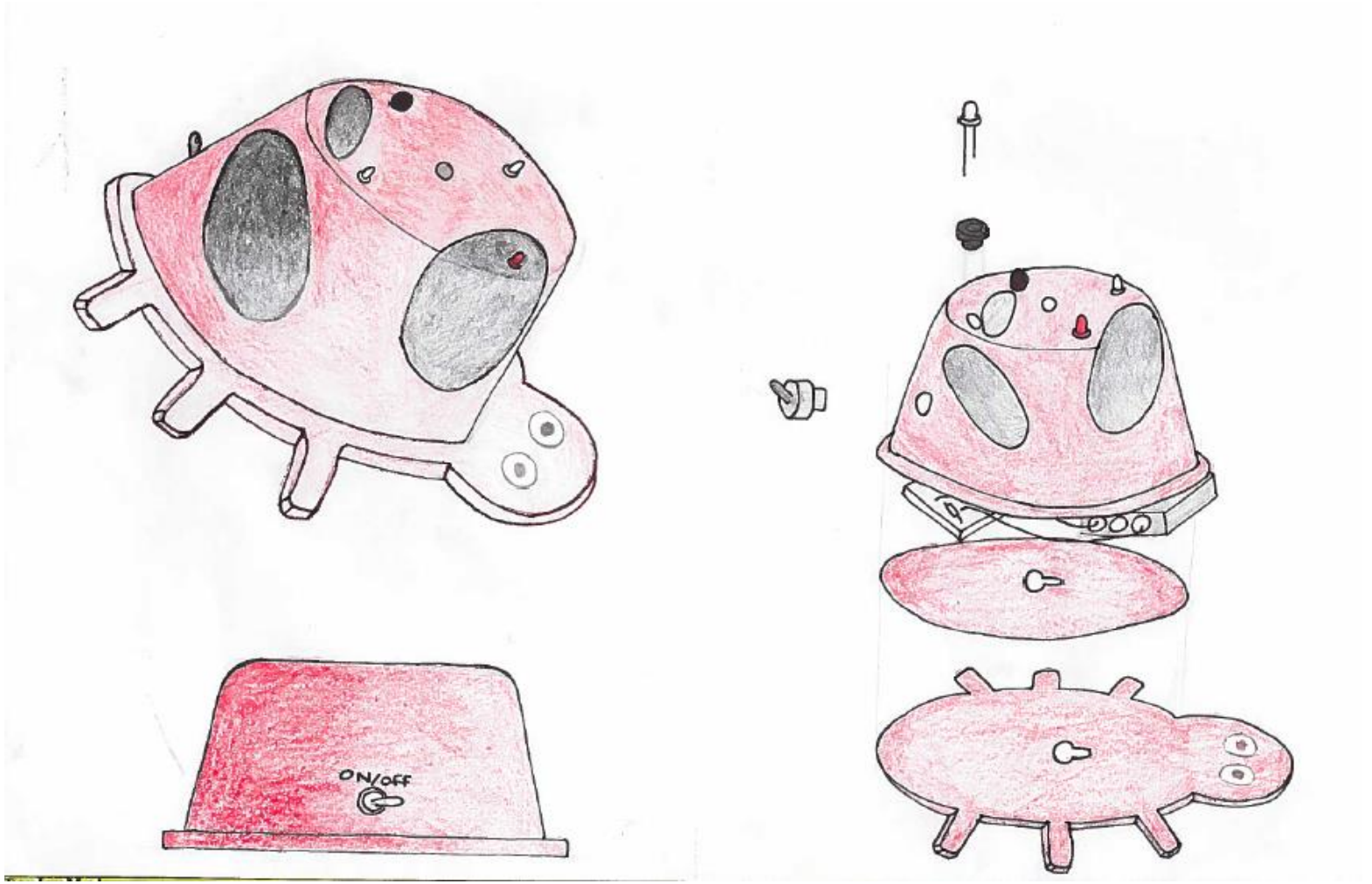
Finalising the individual component parts for the moving money box.

The vacuum formed shell provides space for internal electronic components and mechanical parts to achieve the desired function.

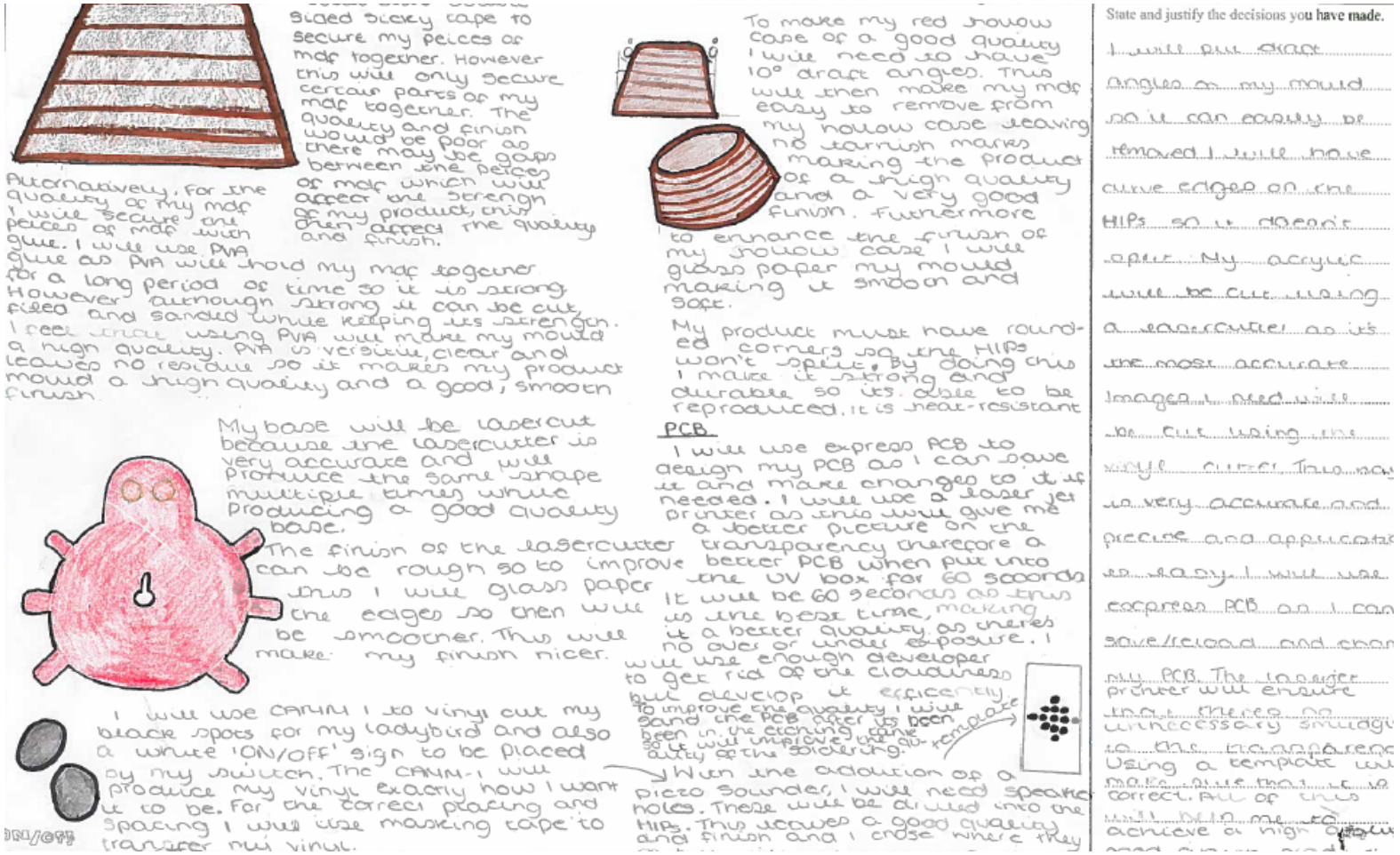


This example shows final technical details of a proposal, with all CAD CAM data, power and speed settings, and CAMM1 vinyl detailing.

The final transparency for PCB manufacture is presented, along with the final flowchart to program the pcb.



This is the final pictorial presentation of the prototype to be manufactured. A good attempt at generating a 3D drawing of a complex product. The exploded diagram offers details of how components are assembled, and how electronic devices are attached to the casing of the prototype.



A manufacturing specification page provides evidence of specific specialist tools, equipment and processing that will be used to manufacture the product.

Band 4 Assessment Criteria - Generating and developing design ideas

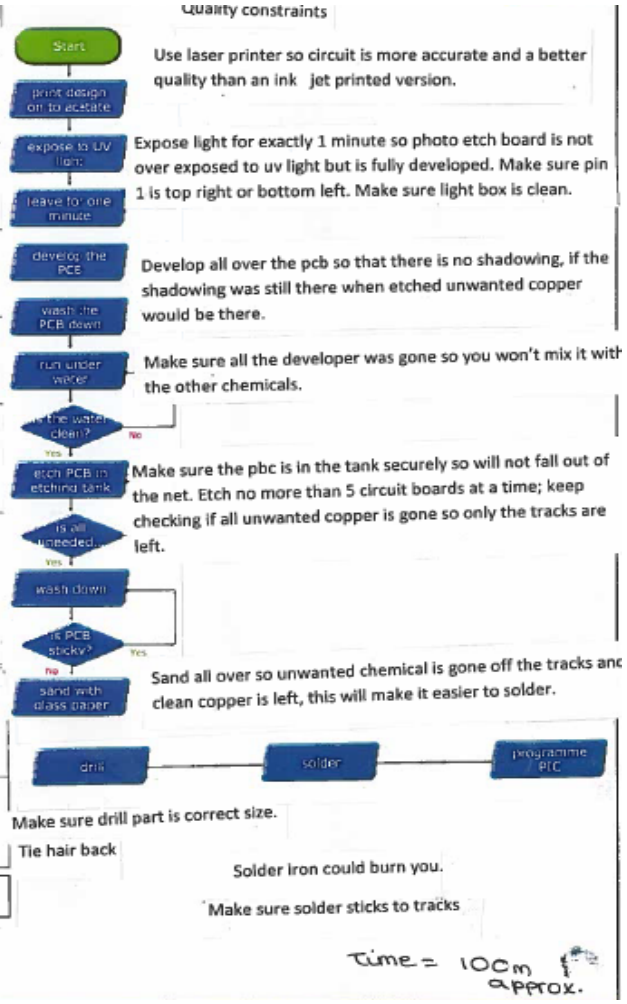
- Considered a range of design strategies, techniques and approaches and applied an iterative design process to generate and communicate a broad, complex and diverse range of initial ideas.
- Identified and considered social, moral and economic factors which are relevant to the context and potential user(s).
- Clear, effective and detailed use of testing to evolve ideas and to refine their design decisions.
- Developed a detailed proposal, including comprehensive and relevant details of materials, dimensions, finishes and production techniques, which clearly address 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.

A learner meeting this assessment descriptor deserves 24-30 marks.

Assessment Criteria		Marks	Assessment objective	Guidance
(a)	Identifying design possibilities.	10	AO1	• *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	AO2	
(d)	***Making a prototype.***	30		
(e)	Evaluating a prototype's fitness for purpose.	20	AO3	
	Total	100		

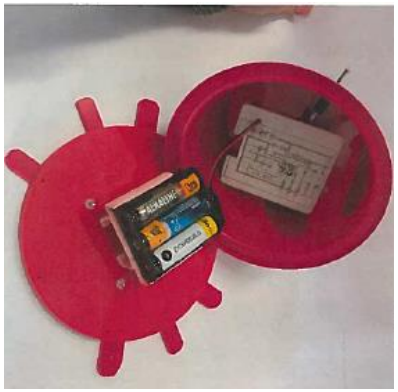
Stage	Method	Material	Tool	Risk	Quality constraints	Time (mins)
1-Marking out	Measure layers of MDF and cut them to 12x12 and glue together using PVA. Leave overnight in clamp or vice.	MDF PVA	Ban saw Ruler Tri Square Clamp/ vice	Cut fingers on ban saw.	Use tri square so lines are parallel. Leave overnight so glue is set.	30
2- Shaping	Shape the glued layers of PCB into the shape of my product using a coping saw.	Glued layers of MDF	Coping saw vice	Snapping blade on coping saw Coping saw cutting your fingers.	Cut on the outside of the line on the shape to leave room for sanding.	60
3-Putting on draft angles and rounding edges	File an angle on the MDF former to it will come out of the vacuum formed HIPS.	MDF former	file	Catch yourself with file	Not putting enough of an angle on. Edges not round enough casing will split.	30
4- Sand down	Sand down with glass paper to there is no dents between layers and the join isn't visible.	MDF former	Sander Glass paper	Catch your finger in the sander. The room can get too dusty	Remove join so it on come out in the HIPs casing.	30
5- Cut base, lenses, hooks for back and acrylic to hold PCB	Design on 2D design and send to the laser cutter so the acrylic will be the right sizes and be self-finishing	Acrylic	Laser cut	The acrylic being hot after taken out of the laser cutter	The acrylic is the correct sizes that are needed, and the laser cutter is on the correct setting.	30
6- Vaccum form	Place the former in the vacuum former with acrylic base underneath and lenses on the former Heat HIP's on vacuum former until its malleable then suck the air out so the case is formed.	HIPs Acrylic lenses Acrylic base Acrylic pieces	Vacuums former		The casing splitting The	40
7-Cut holes for lenses and components	Drill holes with pillar and handheld drill then cut out square with coping saw blade.	HIP casing Components lenses	Pillar drill	Hair or tie getting caught in the drill. Cut fingers on coping saw blades.	The holes being perfect sizes for components not too big or too small.	40
8- Strip heat hooks for back and acrylic to hold PCB	Suspend acrylic on middle of strip heater for 30 seconds and bent to joints needed.	Laser cut acrylic pieces	Strip heater	Burning hand on strip heater	Burning and snapping acrylic or dropping it on the heat source. Making sure acrylic is hot enough to bend.	40

Total hours=5approx



A sequence of stages for the production of the prototype is presented. The stages need to include details about the materials, processes, tools and equipment that will be used at each stage when making the prototype. Factors such as quality control are good indicators that learners are mindful of the necessity for a high quality final proto type.





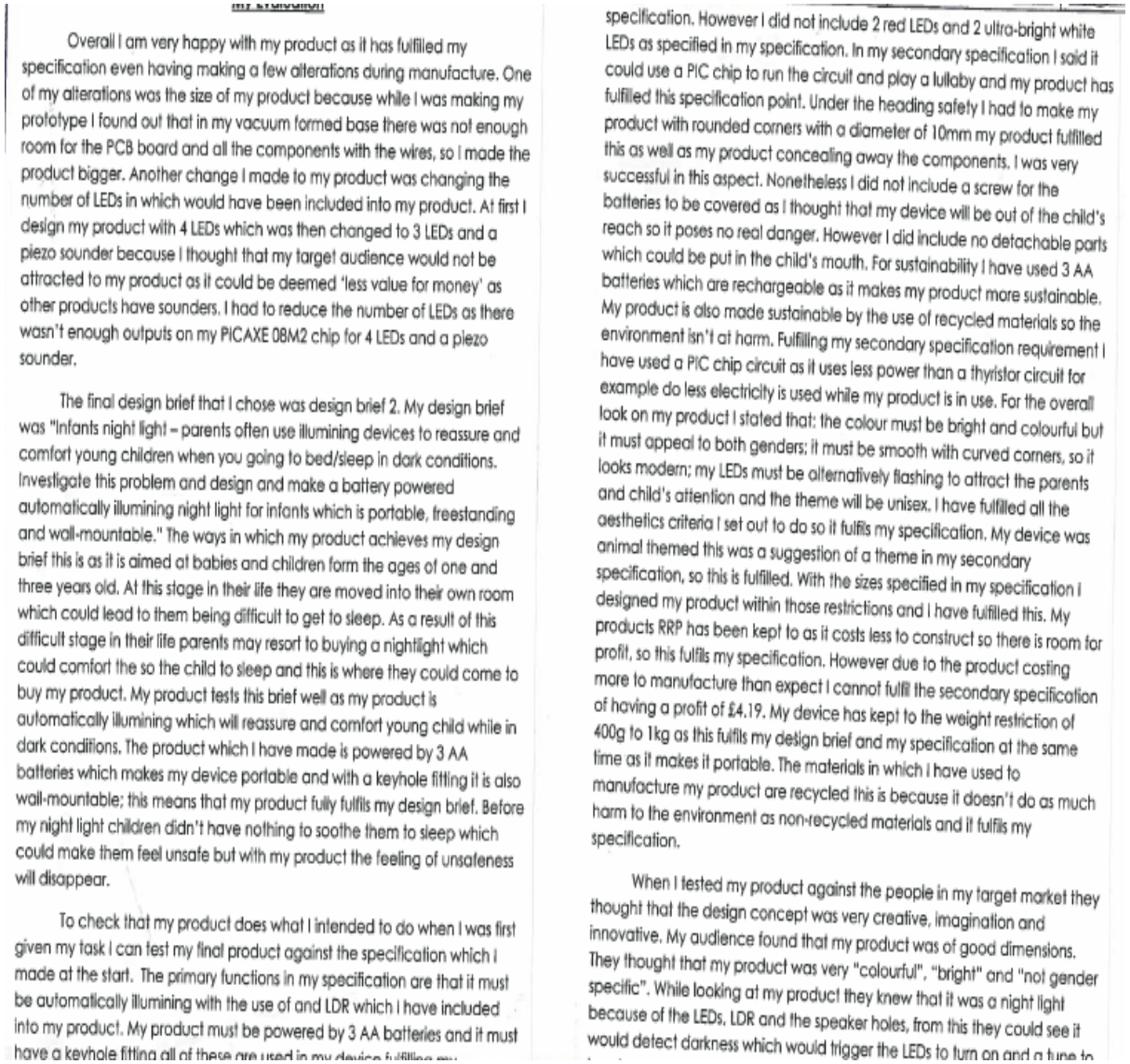

The final prototype is a neatly constructed vacuum formed HIPS shell. The learner has used a wood turning lathe to create the former from layered mdf. There is a laser cut acrylic base so that the HIPS shell fits perfectly and tightly. The bottom layer of acrylic has again been laser cut, with CAMM 1 vinyl used to create two eyes for the ladybird. Inside, the pcb is of a very high quality. It has been developed accurately and constructed well with high level skills. There are no burn marks or defects. There is a battery pack holder which has been cut from a HIPS sheet, heated using a line bender, and set at the desired angle. There are three LEDs equally spaced and neatly positioned using a pillar drill to create the holes, with LED holders mounting the LEDs in place. There is a series of holes drilled with a pcb drill to act as a speaker vent. The on/off toggle switch is located at the back of the product. The LDR is mounted onto the surface of the ladybird and each leg fits through a small pcb drilled hole. CAMM 1 vinyl spots are used to create the spots for the ladybird. The device is fully programmed, works perfectly, to complete a high quality pre-production prototype.

Band 4 Assessment Criteria – Making a prototype

- Clearly communicated comprehensive and relevant details of a logical sequence and achievable timeline for the stages of production and testing of their final prototype.
- Selected and worked with appropriate materials and components to successfully complete the manufacture of their prototype to a defined schedule.
- Used 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.
- An excellent understanding of the working properties and performance characteristics of the specified materials and, where appropriate, demonstrated consideration of surface treatments/finishes.
- Selected and safely used 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 fully meet the user's requirements.

This learner is clearly demonstrating skills within the 24 – 30 mark descriptor.

Assessment Criteria		Marks	Assessment objective	Guidance
(a)	Identifying design possibilities.	10	AO1	• *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	AO2	
(d)	Making a prototype.	30		
(e)	***Evaluating a prototype's fitness for purpose.***	20	AO3	
	Total	100		



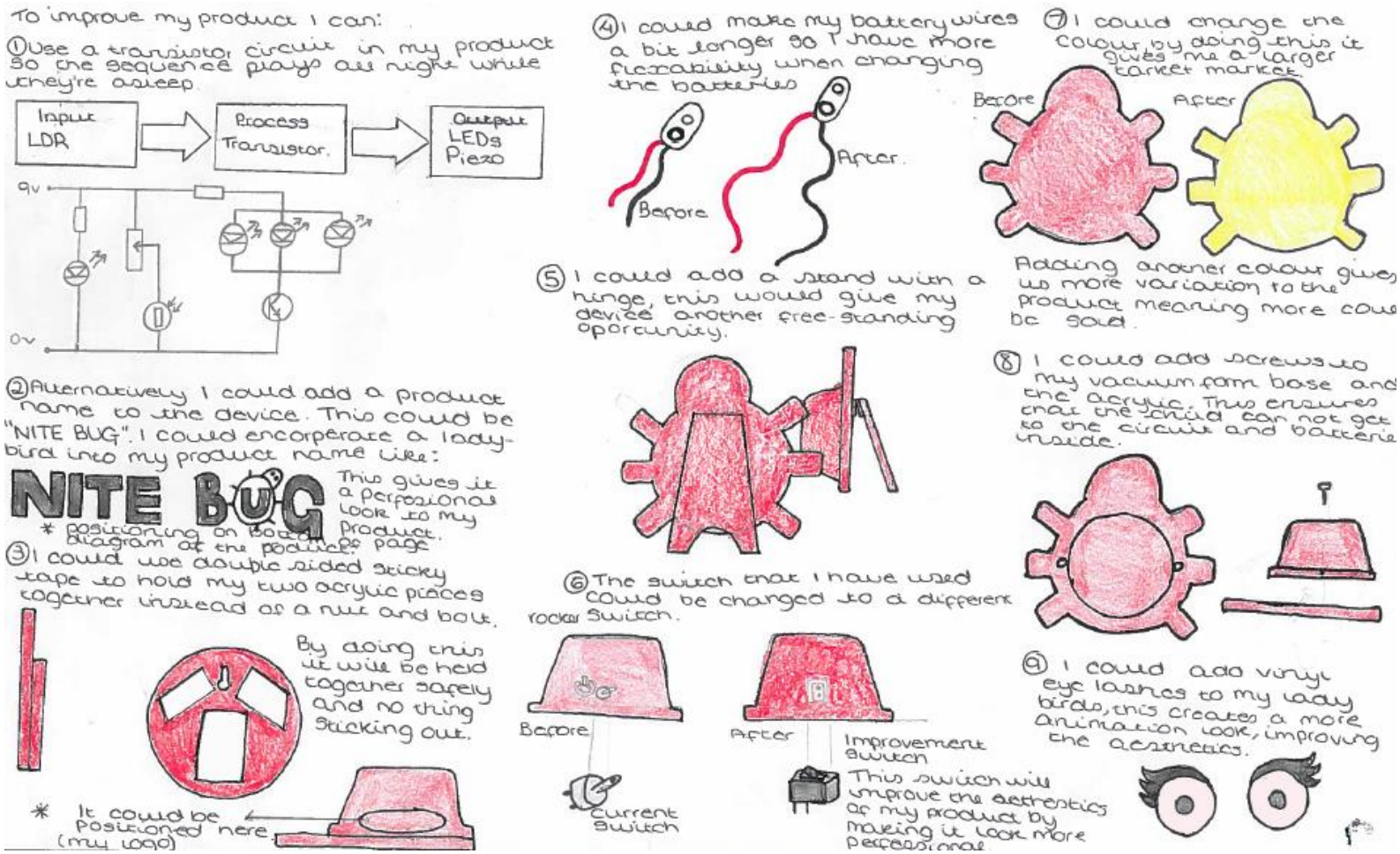
Overall I am very happy with my product as it has fulfilled my specification even having making a few alterations during manufacture. One of my alterations was the size of my product because while I was making my prototype I found out that in my vacuum formed base there was not enough room for the PCB board and all the components with the wires, so I made the product bigger. Another change I made to my product was changing the number of LEDs in which would have been included into my product. At first I design my product with 4 LEDs which was then changed to 3 LEDs and a piezo sounder because I thought that my target audience would not be attracted to my product as it could be deemed 'less value for money' as other products have sounders. I had to reduce the number of LEDs as there wasn't enough outputs on my PICAXE 08M2 chip for 4 LEDs and a piezo sounder.

The final design brief that I chose was design brief 2. My design brief was "Infants night light – parents often use illumining devices to reassure and comfort young children when you going to bed/sleep in dark conditions. Investigate this problem and design and make a battery powered automatically illumining night light for infants which is portable, freestanding and wall-mountable." The ways in which my product achieves my design brief this is as it is aimed at babies and children form the ages of one and three years old. At this stage in their life they are moved into their own room which could lead to them being difficult to get to sleep. As a result of this difficult stage in their life parents may resort to buying a nightlight which could comfort the so the child to sleep and this is where they could come to buy my product. My product tests this brief well as my product is automatically illumining which will reassure and comfort young child while in dark conditions. The product which I have made is powered by 3 AA batteries which makes my device portable and with a keyhole fitting it is also wall-mountable; this means that my product fully fulfils my design brief. Before my night light children didn't have nothing to soothe them to sleep which could make them feel unsafe but with my product the feeling of unsafeness will disappear.

To check that my product does what I intended to do when I was first given my task I can test my final product against the specification which I made at the start. The primary functions in my specification are that it must be automatically illumining with the use of and LDR which I have included into my product. My product must be powered by 3 AA batteries and it must have a keyhole fitting all of these are used in my device fulfilling my specification. However I did not include 2 red LEDs and 2 ultra-bright white LEDs as specified in my specification. In my secondary specification I said it could use a PIC chip to run the circuit and play a lullaby and my product has fulfilled this specification point. Under the heading safety I had to make my product with rounded corners with a diameter of 10mm my product fulfilled this as well as my product concealing away the components. I was very successful in this aspect. Nonetheless I did not include a screw for the batteries to be covered as I thought that my device will be out of the child's reach so it poses no real danger. However I did include no detachable parts which could be put in the child's mouth. For sustainability I have used 3 AA batteries which are rechargeable as it makes my product more sustainable. My product is also made sustainable by the use of recycled materials so the environment isn't at harm. Fulfilling my secondary specification requirement I have used a PIC chip circuit as it uses less power than a thyristor circuit for example do less electricity is used while my product is in use. For the overall look on my product I stated that: the colour must be bright and colourful but it must appeal to both genders; it must be smooth with curved corners, so it looks modern; my LEDs must be alternatively flashing to attract the parents and child's attention and the theme will be unisex. I have fulfilled all the aesthetics criteria I set out to do so it fulfils my specification. My device was animal themed this was a suggestion of a theme in my secondary specification, so this is fulfilled. With the sizes specified in my specification I designed my product within those restrictions and I have fulfilled this. My products RRP has been kept to as it costs less to construct so there is room for profit, so this fulfils my specification. However due to the product costing more to manufacture than expect I cannot fulfil the secondary specification of having a profit of £4.19. My device has kept to the weight restriction of 400g to 1kg as this fulfils my design brief and my specification at the same time as it makes it portable. The materials in which I have used to manufacture my product are recycled this is because it doesn't do as much harm to the environment as non-recycled materials and it fulfils my specification.

When I tested my product against the people in my target market they thought that the design concept was very creative, imagination and innovative. My audience found that my product was of good dimensions. They thought that my product was very "colourful", "bright" and "not gender specific". While looking at my product they knew that it was a night light because of the LEDs, LDR and the speaker holes, from this they could see it would detect darkness which would trigger the LEDs to turn on and a tune to

There are evaluative comments running throughout the iterative development of the proposals. The final analysis is clearly linked to the brief and specification, and critical and perceptive comments are evident.
Opinions are sought from others, but there is little evidence of this. The learner would benefit from constructing a live user trial, with photographic/video evidence of the testing, together with the thoughts, opinions and comments of those users.



There is some evidence of reflection on feedback here, where this learner offers further modifications. This needs to be a designing/sketching based activity where learners do not simply point out faults, but offers solutions and further refinements which would develop the final prototype further.

Band 4 Assessment Criteria – Evaluating a prototype's fitness for purpose.

- Undertaken a critical, objective analysis, evaluation and testing of their ideas and decisions whilst applying iterative design processes.
- Undertaken a critical and objective evaluation and testing of their final prototype, taking into account the views of potential users.
- Responded to feedback and clearly identified the potential for further development of their prototype, with detailed suggestions for how modifications could be made.

The learner does not quite meet all of the descriptors here, so cannot be awarded the Band 4 level 16 – 20 marks. The learner deserves a Band 3 mark, which fits between 11-15 marks. There is some reference to users and testing, but due to the lack of evidence, and depth of analysis, 13 marks would be a fair reflection.

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

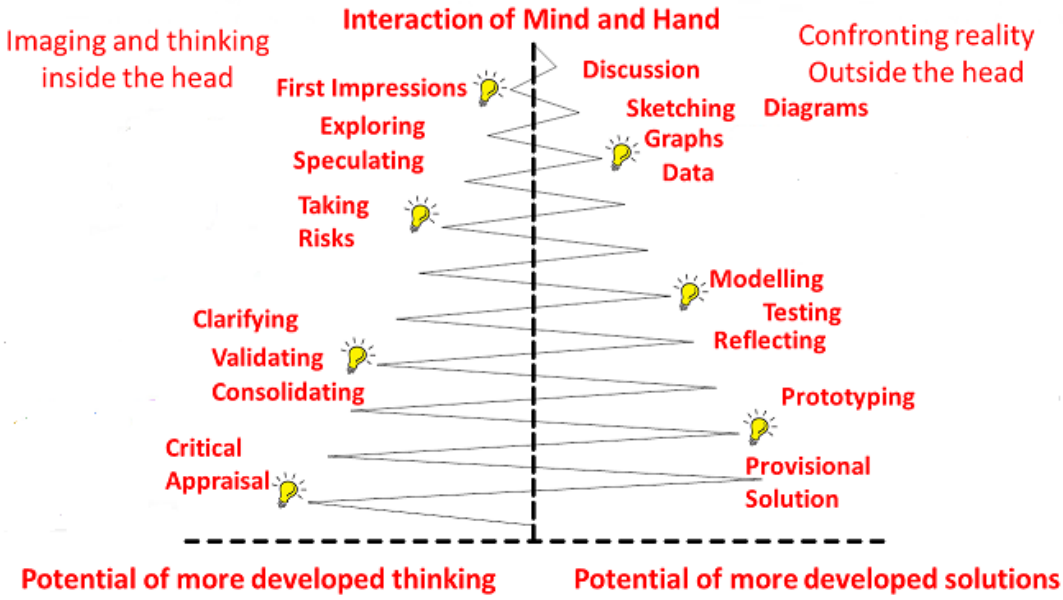
Informal A4/A3 sketchbook	Formal presentation A3 portfolio	Final prototype (fully functioning high quality product)

Exemplar pages can be found on the WJEC website:

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

Design iteration

Definition: A design method based on the process of prototyping, testing, analysing and refining a product or process. It is not a 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

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

You are allowed to guide/support the learner through the iterative process. The subject teacher should check that the learner selects a problem that is appropriately challenging and provides the opportunity to address all the assessment criteria. For further details on teacher guidance please refer to pages 32-33 of the specification.

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

- Written Examination: 2 hours
- 50% of qualification
- 100 marks in total
- The paper will include a mix of short answer structured questions and more demanding questions that require an extended response.

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 questions

Q.1 Designers often use Computer Aided Design (CAD) programmes to produce virtual or 3D prototypes of new fashion garments.

Explain how this process is a more sustainable approach to design. [4]

Exemplar responses

No material is used to make a prototype. **1 mark**

A very simple response which shows some understanding of the virtual process nothing specific about sustainability.

No materials or components are needed as no garment is actually made. **2 marks**

A clear statement showing understanding of virtual design including a further statement to reinforce that fact – 'nothing is actually made' but nothing specific about sustainability.

As the prototype is only viewed on screen in a realistic way there is no need to waste materials and components making a prototype. **3 marks**

This response demonstrates that the learner has full understanding of the virtual process; the points made are clearly explained and include use of materials but not how this is sustainable.

As the prototype is only viewed on screen in a realistic way there is no need to waste materials and components making a prototype which reduces the carbon footprint and is therefore a more sustainable way of designing products. **4 marks**

This response demonstrates that the learner has full understanding of the virtual process; the points made are clearly explained including reference to materials. The answer is fully extended to show knowledge and understanding of sustainability i.e. 'carbon footprint'.

For the above question responses could refer to:

No actual/physical prototype product is made therefore there are benefits to the environment /sustainability: materials, components, threads for example are not used, saving resources; when the product is redesigned or rejected the materials etc. are not wasted and will not end up as possible landfill; conservation of energy/ less pollution – saved in manufacturing prototypes; reduced carbon footprint for the prototype is therefore more sustainable.

Q.2 Textile manufacturers are increasingly turning to renewable energy to power their factories.

Explain how the use of renewable energy in the textile manufacturing industry improves the carbon footprint of textile products. [4]

Exemplar responses

Renewable energy is less polluting. **1 mark**

A simple response which shows some understanding of renewable energy but lacks further explanation.

Renewable energy is considered better for the environment because it does not pollute the atmosphere. **2 marks**

A clear statement showing understanding of renewable energy including a further statement to reinforce that fact – 'reference to pollution'.

Renewable energy is considered much better for the environment because it does not pollute the atmosphere as carbon emissions are reduced which would be an improvement. **3 marks**

This response demonstrates that the learner has a good understanding of renewable energy; the points made are clearly explained and includes reference to carbon emissions – higher order thinking/reasoning – a good demonstration of knowledge.

Renewable energy is considered much better for the environment because it does not pollute the atmosphere as carbon emissions are reduced. As the textile industry is vast (globally) renewable energy would dramatically improve the carbon footprint of textiles. **4 marks**

This response demonstrates that the learner has full understanding of how energy impacts of the environment and how renewables reduce the impact. Two different points - each fully explained and justified.

For the above question responses could refer to:

An understanding of renewable energy, based on infinite resources which is readily available provided certain external factors are met; energy is generated then stored, to be used as when as a power source; 'greener' energy as no pollution/reduces carbon emissions; globally, the fashion and textile industry is one of the largest contributors to carbon emissions due to the size and scale and the complex supply chain. NOTE: Credit can be given to naming renewables (geothermal, hydro, wave, solar and wind).

- *Learners will be expected to demonstrate knowledge and understanding of the terms renewable energy and carbon footprint. These technical terms would naturally be used when teaching this section of the specification.*
- *'Explain' used as a command word at the start of a question requires a fact and an elaboration of that fact. Listing a range of different points will gain little or no credit.*
- *For a 4 mark question a response could be **one point** fully elaborated on or **two separate points** which have been fully explained.*

Q.3 The cycling shorts shown below are made from elastane.
Evaluate the suitability of this material for the cycling shorts. [5]

Wikimedia Creative Commons http://bit.ly/2Gw9RrG

Exemplar responses

Elastane allows clothing to stretch and fit better. **1 mark**

A simple response which shows some understanding of the main property of elastane but lacks further explanation.

Elastane allows clothing to fit snuggly to the body and will not restrict the movement of the wearer. **2 marks**

A clear statement showing understanding of the main property of elastane with some understanding of an advantage it would give the user.

Elastane has excellent recovery when stretched; this can be achieved repeatedly; when incorporated into clothing it helps support a closer fit. **3 marks**

Detailed understanding of the main property of elastane with a balanced reason for its specific use in this product.

Elastane has excellent recovery when stretched; this can be achieved repeatedly; when incorporated into clothing it helps support a closer fit; the wearer can move freely without restriction. **4 marks**

Detailed understanding of the main property of elastane with a balanced reason for its use in this product. The learner has assessed the main properties of elastane and applied it to the main purpose of the cycling shorts, explaining why it would be beneficial for the user of the cycling short.

Elastane has excellent recovery when stretched; this can be achieved repeatedly; when incorporated into clothing it helps support a closer fit; the wearer can move freely without restriction from clothing as the clothing will move/stretch with movement. **5 marks**

Detailed knowledge and understanding: knowledge of the properties of elastane; applied it to the cycling shorts and their intended use; justified the reasons for using elastane.

- *This type of question is designed to test, stretch and challenge the more able learner. The question requires the learner to make a well-balanced argument involving both advantages and disadvantages.*
- *Evaluate could imply assessing or appraising a situation or product or material giving reasons to support their answers.*

For the above question responses could refer to:

Elastane has excellent recovery when stretched; this can be achieved repeatedly; when incorporated into clothing it helps support a closer fit; the wearer can move freely without restriction from clothing as the clothing will move/stretch with movement. Elastane used in clothing such as the cycle shorts would add to the comfort of the user duding use. A possible disadvantage could be that the elastane is perishable and where it is cut on the seams can through friction unravel reducing the stretch.

Q5. Study the fashionable products shown below which are available in a range of sizes. The sizes are based on anthropometric data

Analyse the importance of using anthropometric data to develop clothing and footwear in a range of s

Product Information:
Coat: Available in sizes 10 - 18
Boots: Sizes 3 - 8, 3 calf fittings

Marks will be awarded for the content of the answer and the quality of written communication.

For the above question responses could refer to:

Coat: average height of people for the length; also allows for the development of shorter/taller than average clothing to be developed; arm lengths - differ according to height of average person; bust, waist, hip measurement are all based on standard sizes. Petite sizes are generally smaller averages for bust, waist etc. but short people are not necessarily petite but clothing still needs to fit. Depth of armholes need to be considered so that arms can move freely without restriction; width of arms – no restrictions; head sizes for hood – head sizes often differ alongside average height.

Boots: Adult boots usually made in a range of sizes 3 – 11 for example. Feet are different lengths. Foot width can differ – ill-fitting shoe widths can cause problems for the wearer. Heel height needs to be considered for comfort; heel too high can make wearer imbalanced and give poor posture – causes other problems for user. Calf width fitting on a boot as people with wider legs may not be able to get a boot on or would be restricted in some way. Length of boot from ankle to knee – shape of body of boot should mirror leg shape and fit as design intends it to be worn.

- *Analyse is harder style of question for the learner to answer and in this case the examiner will also be checking the quality of written communication. Within the body of the answer it must be clearly evident that the learner has an understanding of anthropometrics and how it is applied specifically to the products shown.*

- *For this specific question learners would need to demonstrate knowledge and understanding of anthropometrics being based on average human measurements to give standard sizes; it allows designers to develop products that fit as intended and allow for the products to be used/ worn comfortably and are fit for purpose. Learners would be expected to study the products and information and interpret the information in their responses.*

- *As there are two products in this question a learner would need to show understanding of the specific issues relating to **both** products in their answer. Each anthropometric point identified should be fully explained in terms of user/comfort/fitness for purpose.*

- *Typically up to 3 marks would be awarded for knowledge of anthropometrics and up to **7** marks for **specific details** on both products.*

- *This type of question is designed to test, stretch and challenge the more able learner. The question requires the learner to make a well-balanced argument involving both advantages and disadvantages.*

- *For this type of question Analyse means examining and dissecting a situation or product giving thoughtful appropriate reasons to support the answer. It could include finding logical chains of reasoning.*

- *On this type of question the examiner will use a banded mark scheme to assess the quality of the answer.*

No answer or no relevant issues described or discussed.	**0**
Simple understanding of anthropometrics. Little, if any, understanding of the application of relevant data in either of the 2 products shown. Little understanding of the term anthropometrics Quality of Written Communication is limited, presenting material with limited coherence, many errors of grammar, punctuation and spelling.	**1-2**
Some description of anthropometrics. Some understanding of the application of relevant data in the 2 products shown, may apply some knowledge to one product. Some understanding of the term anthropometrics but tends to be superficial. Quality of Written Communication is basic, presenting occasionally appropriate material with some coherence, some errors of grammar, punctuation and spelling.	**3-4**
Description and understanding of anthropometrics. More detailed knowledge and understanding of the application of relevant data in the 2 products shown, may apply more knowledge to one of products. Information is relevant and there is a clear understanding of the term anthropometrics. 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 very detailed understanding and description of anthropometrics. Clear and detailed knowledge and understanding of the application of relevant data in the 2 products shown, detailed knowledge applied to both products – detailed understanding of anthropometrics is clearly evident. 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**

Unit 2 – Design and make task – Fashion and Textiles

- **NEA** – Non Examined Assessment – 50% of the qualification
- Approximately 35 hours
- Design and make task from a contextual challenge set by WJEC
- Worth 100 raw marks
- Apply the iterative process of designing

The assessment criteria for the NEA are generic, learners who focus on fashion and textiles are more likely to undertake work which reinforces the knowledge and understanding tested in the examination paper.

NEA: A sustained design and make task, based on a contextual challenge set by WJEC, 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 a visiting moderator.

Requirements

Three contextual challenges available June 1st in the year preceding the year in which the qualification is awarded. Learners will choose to tackle **one** challenge. From the challenge the learner will investigate and decide upon possible problems/issues before deciding on a possible design task to tackle.

There will be NO SET PAGE FORMAT for the NEA.

Suggested structure of evidence required

Tip: why not make up your own sketchbooks and formal portfolio by using existing or previous projects or control assessed work.

*The following pages are from previous learners work. Note: They are **NOT** exemplar A grade pages.*

For more detailed examples, teachers should look at the CPD information on the website.

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

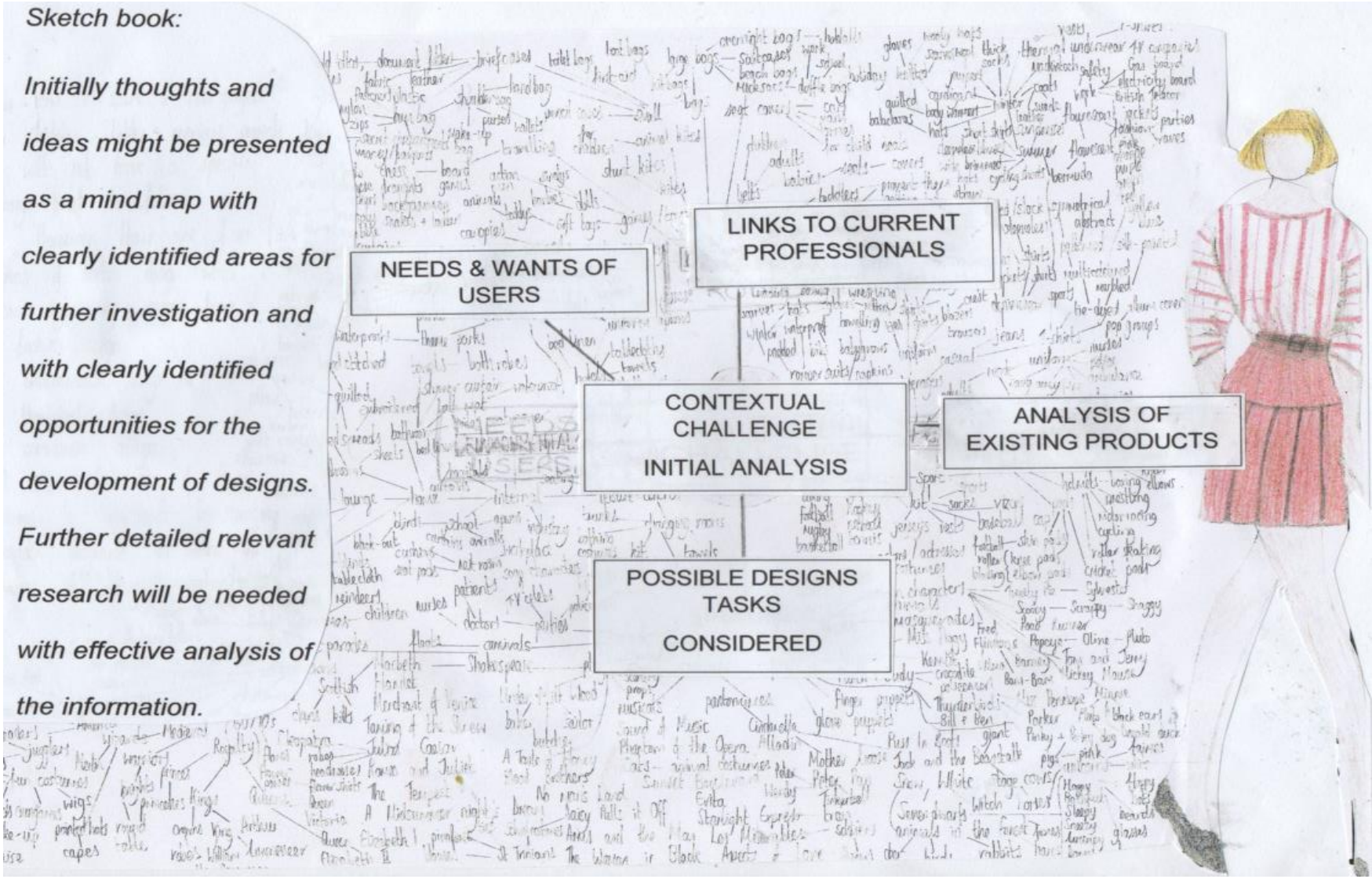
Informal A4/A3 sketchbook	Formal presentation A3 portfolio	Make/practical outcomes
This should clearly show evidence of: • identifying design possibilities • generating and developing design ideas.	This should clearly show evidence of: • final brief and specification • final prototype – pictorial details • final prototype – technical details • final prototype – production details • sequence of production • evaluation of final prototype • modifications and further developments • photographs of final prototype	Final prototype (fully functioning high quality product) You must include any supporting practical pieces including toiles, models, patterns, tests, trials, iterations. Some of the above could be included in the sketchbook.
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.		

Assessment criteria for the design and make contextual challenge.

Assessment Criteria		Marks	Assessment objective	Guidance
(a)	***Identifying design possibilities.***	10	AO1	• *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	AO2	
(d)	Manufacturing a prototype.	30		
(e)	Evaluating a prototype's fitness for purpose.	20	AO3	
	Total	100		

Sketch book:

Initially thoughts and ideas might be presented as a mind map with clearly identified areas for further investigation and with clearly identified opportunities for the development of designs. Further detailed relevant research will be needed with effective analysis of the information.



Focussing on users

Relevant research/ product analysis

Provide details of the Target Market for your product.

I have decided to design a soft furnishing for a child's bedroom. The product will be unisex and for the ages between 12 months-3 years old.

Parents

The parents choice of soft furnishing would be a unisex product which is not expensive but is also of a good quality. They would often buy products from nearby super-markets or nursery shops but they would still want something that won't age quickly. They would like a product that won't stretch their budget because they have a low income. They would also like a product which is colourful, eye-catching and entertaining. They also may want something educational. They would obviously want a safe product so that no harm will come to their child. The parent often leads a busy life so something that can be washed and dried easily would be better.

This is the sort of family that I'm designing the product for. A family of four with a baby and toddler.

Provide details of the results of the Research that you have carried out into the problem.

I've looked on the internet at soft furnishings to decorate a child's bedroom and what is already available in stores. There are a wide variety of items that can be purchased such as baby rugs, cushions, floor cushions, bean bags, curtains, wall hangers, throws and soft building blocks. The product has to be safe so no child harms themselves. To keep the product safe for use there should be no sharp edges, no loose treads that could be pulled and fray the item, there should be no small objects that a child could swallow and the material must be non-flammable. Most soft furnishings are brightly coloured and the most popular colours are orange, yellow, pink, red, and purple. The products are usually made out of soft fabrics like cotton and fleece. The products that I looked at had funny characters or animals on them but they also had girly ones with butterflies on and more boyish ones with super heroes on. The size of the soft furnishing products range from big to small all depending on the age of the child. From my research I found out that all soft furnishings for a child's bedroom have some sort of entertainment on them. Squeakers, soft touchy feely fabrics, mirrors and rattles are found on soft furnishing products. Some items maybe educational. You can purchase these products in shops and on the internet. The most popular stores and websites are IKEA, mother care and any big super-markets. The cost of the items depends on the stores they are purchased from and the manufacture or brand. I asked older family members what they did with the soft furnishing items they had for their children, the replies I had were all very similar. "I kept it for a future child we may have had" was one of the most popular replies I had off my family. From this information I have concluded that the products have to be suitable and last a number of years. I will use this information when I start designing.

Provide details of the results of your Analysis of a Competitor Product.

Function: the main purpose of this product is to entertain and stimulate a young child. It is meant to help the child with their hand and eye co-ordination through building up blocks and stacking them one on top of the other.

Aesthetics: The item has small range of bright colours and have funny characters and animals appliqued on to them. The fabrics used have different textures to them. The product is cubed and has many different faces on them

Safety: The item is safe for a young child to play with as it has no sharp edges that could harm a child. It has no loose threads that a child could pull and break the item. There are no small objects attached to the item that the young child could swallow.

Target Market: The product has been designed for a young child but as they don't really know what they like the main target market here is the parents. It has been made with the parents wishes in mind but is also child friendly.

Dimensions/size: The building blocks are the right size for a young child to grasp with both hands. The exact size of the blocks is not given but are suitable for the ages of 6-18 months.

Quality: The quality of this product is really good. It has been put together well and sewn neatly with no faults. It looks like it will last a number of years. The product is tough and durable.

Economics: The product was being sold for £14.99. I don't think this is a reasonable price as it may stretch a parents budget, on the other hand it will last a long time and the product will entertain and stimulate a young child so its worth the money.

State your Final Design Brief here.

I have decided to design a unisex soft furnishing item such as a floor cushion/beanbag to decorate a young child's bedroom. It will be for the ages between 12months and 3 years old. The style of the product needs to entertain and stimulate the child. It need to have bright colours and animals on it to make it eye-catching and different from the other products on the high street. It needs to retail below £25 which will make it affordable for the parents. It needs to be washable and with stand wear and tear.

A range of possible design briefs

- *Understanding of the problem.*
- *Focussing on users.*
- *Research strategies*
- *Analysis of information.*
- *Focussed relevant research.*

Band 4 Assessment Criteria - Identifying design possibilities

- Undertaken thorough and effective identification of opportunities for the development of designs within the prescribed context.
- Undertaken detailed, relevant research and investigation, clearly linked to the context and, where appropriate, the work of past/present professionals and companies.
- Undertaken detailed and effective analysis of information, reflecting the needs, wants and values of clients or potential users.
- Identified a broad range of problems/opportunities to clearly inform the development of possible design briefs.

Learners meeting the four descriptors from Band 4 of the marking criteria deserve 9-10 marks.

The specification must be used as a design tool, and any ideas, models, tests; initial prototypes must be evaluated against the specification criteria. There are important features used as headings with multiple statements within each heading. Points in the specification could be expanded and detail added, the function should be clearly stated with real measurable criteria. The example is not a strong specification and therefore would not be able to achieve high marks.

Assessment Criteria		Marks	Assessment objective	Guidance
(a)	Identifying design possibilities.	10	AO1	• *A clear and detailed Design Brief.* • *Specification with measurable criteria used.* • *Users' needs and wants identified.* • *Specific factors critical to success.* • *Identifies key aspects including Form, Function, Materials, Sizes, Safety, Ergonomics, Cost etc.*
(b)	***Developing a design brief and specification.***	10		
(c)	Generating and developing design ideas.	30	AO2	
(d)	Making a prototype.	30		
(e)	Evaluating a prototype's fitness for purpose.	20	AO3	
	Total	100		

Function-

{essential}

1.1– My product must be suitable to wear in the summer.

1.2-The dress must be reasonably comfortable to wear.

1.3– The dress must give the wearer the feel-good factor, increasing self esteem.

Aesthetics-

{desirable}

2.1– The dress must be feminine.

2.2– It must be girly and have colours that will appeal to the target market.

2.3– The style must appeal to the target market and be on trend.

Environmental considerations-

{essential}

3.1– I must consider the 6 R's (Recycle, Reuse, Reduce, Rethink, Repair and Refuse) when designing and making the dress.

3.2– I must minimise the impact made on the environment in production and in the up-keep of the product.

3.3– I must insure that the dress can be machine washed at a low temperature.

3.4– With any leftover material I must create a small item to go with the garment.

Target group-

{essential}

4.1- The dress must fit a size 8 female.

4.2– It should be suitable for grading into a range of size 6-10 for manufacture.

Style-

{desirable}

5.1– The dress must have a fitted top and a more flowing skirt.

5.2– The skirt must be short.

Economics-

{desirable}

6.1– The dress must not be too expensive to produce, and I will re-use and recycle resources to reduce costs.

6.2– It must not cost over £40 to produce.

Materials-

{essential}

7.1– The materials must be either recycled or sustainable fabrics.

7.2– They must be light materials that will keep the wearer cool during the summer.

Quality-

{desirable}

8.1– The product must be made to a high standard so that it will last longer and make less of an impact on the environment.

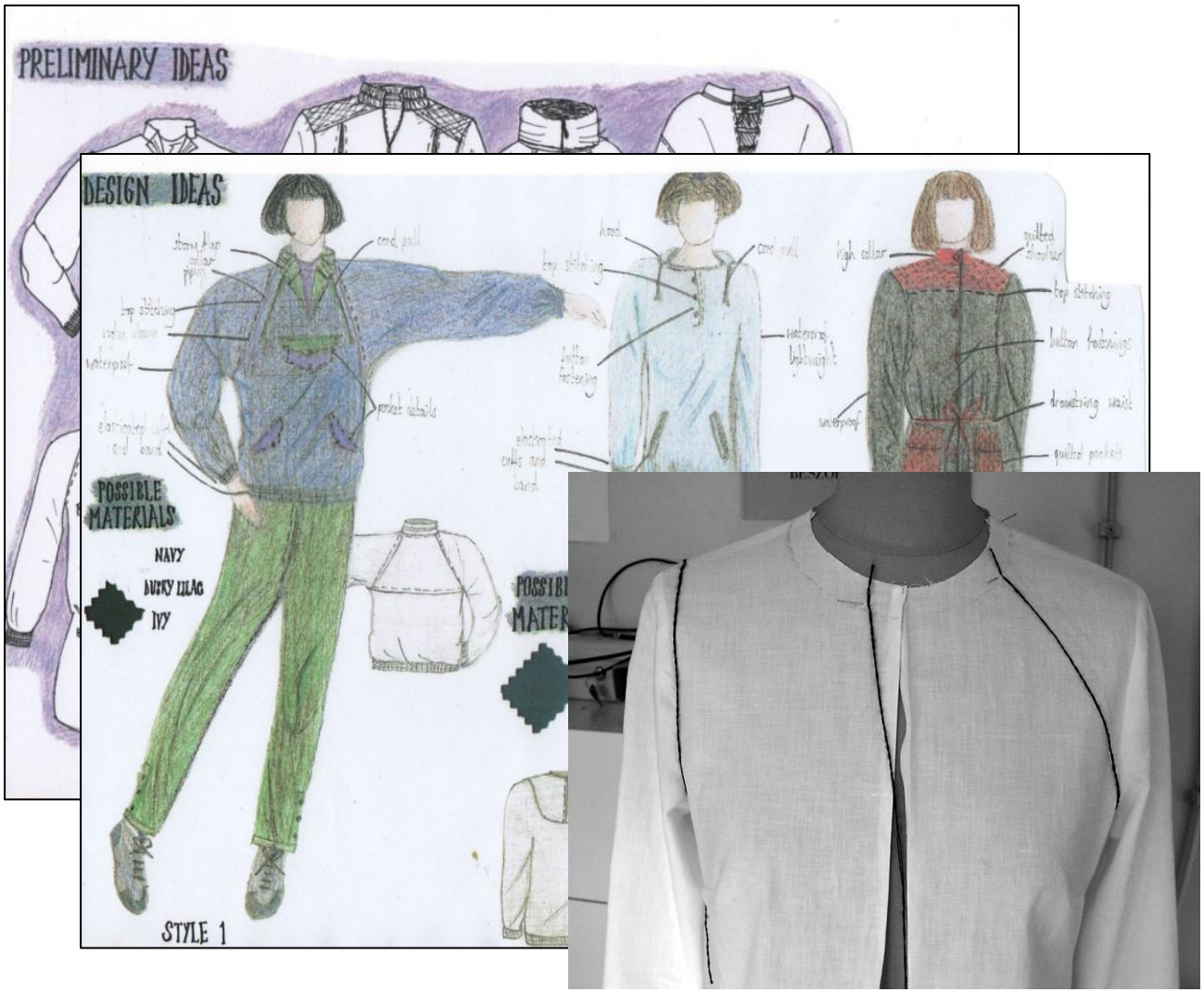
Band 4 Assessment Criteria - Developing a design brief and specification

- Fully considered a range of problems/opportunities before deciding upon a final design brief.
- Demonstrated a very good understanding of the task ahead and the requirements which have to be met, to satisfy fully the needs, wants and interests of potential users.
- Written a design brief, relevant to the context, based upon a thorough analysis of their research and investigation.
- Written a detailed, relevant specification, including a range of objective and measurable criteria, to direct and inform the design and manufacture of a prototype.

A learner who meets the descriptors above deserves to be awarded 9-10 marks in Band 4.

Assessment Criteria		Marks	Assessment objective	Guidance
(a)	Identifying design possibilities.	10	AO1	• *30% of the NEA* • *An iterative approach is required.* • *Initial ideas.* • *Good concepts.* • *Detailed information.* • *A sound starting point.* • *On-going evaluation.* • *Lots of ideas rejected.* • *Shape / form / aesthetics.* • *First toile – evidence of modelling could be considered at this point for overall form/style.*
(b)	Developing a design brief and specification.	10		
(c)	***Generating and developing design ideas.***	30	AO2	
(d)	Making a prototype.	30		
(e)	Evaluating a prototype's fitness for purpose	20	AO3	
	Total	100		

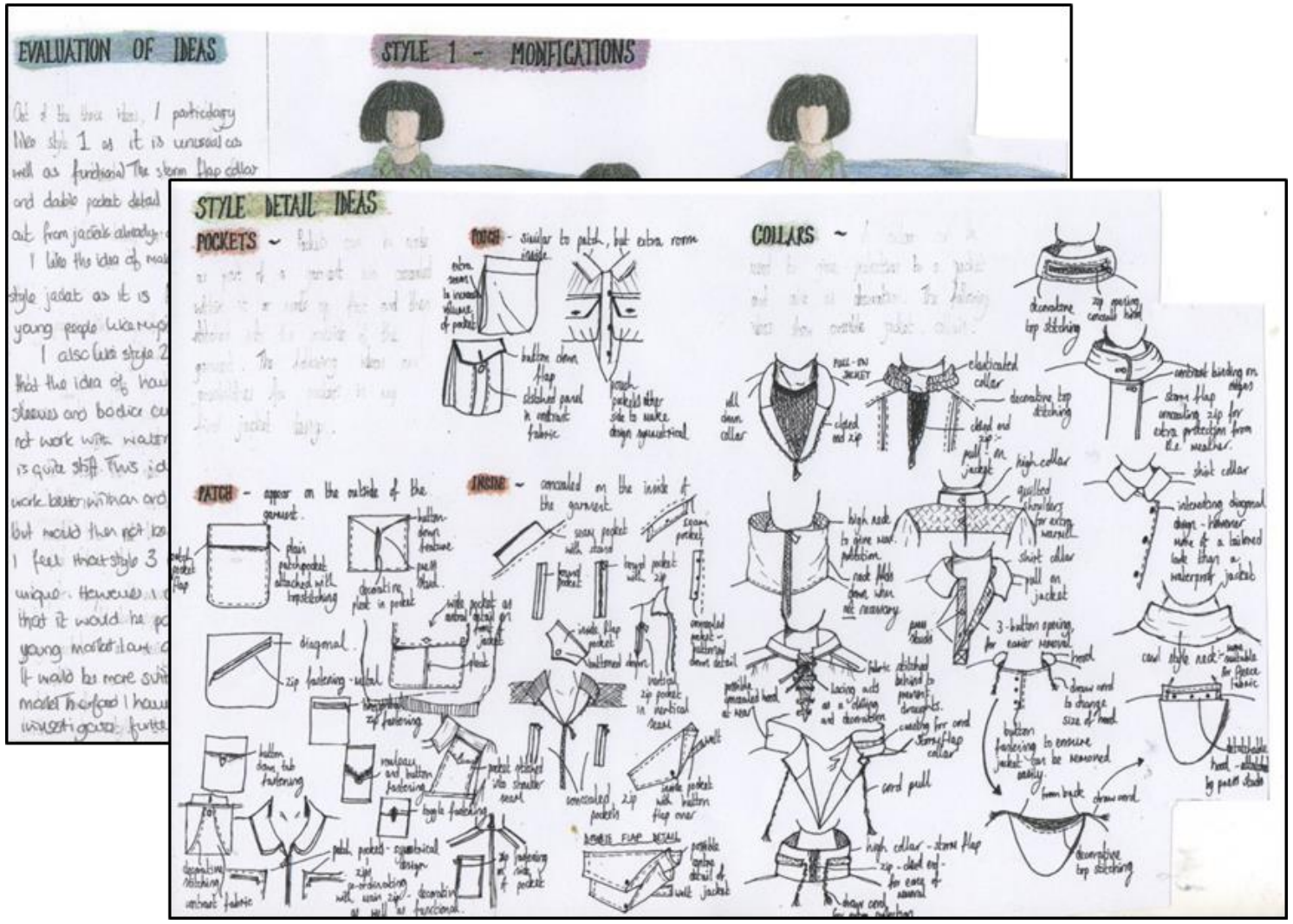
This aspect of the NEA represents a large mark allocation, and there will need to be a variety of types of evidence to achieve high marks here. The iterative approach must allow learners to 'unpick' the problem and begin to come up with possible ideas for parts of the potential solution. There must be a clear 'think, create, test, evaluate' cyclic approach to the activities that learners undertake as part of their generating and developing of design ideas. This culminates in the presentation of the final prototype.



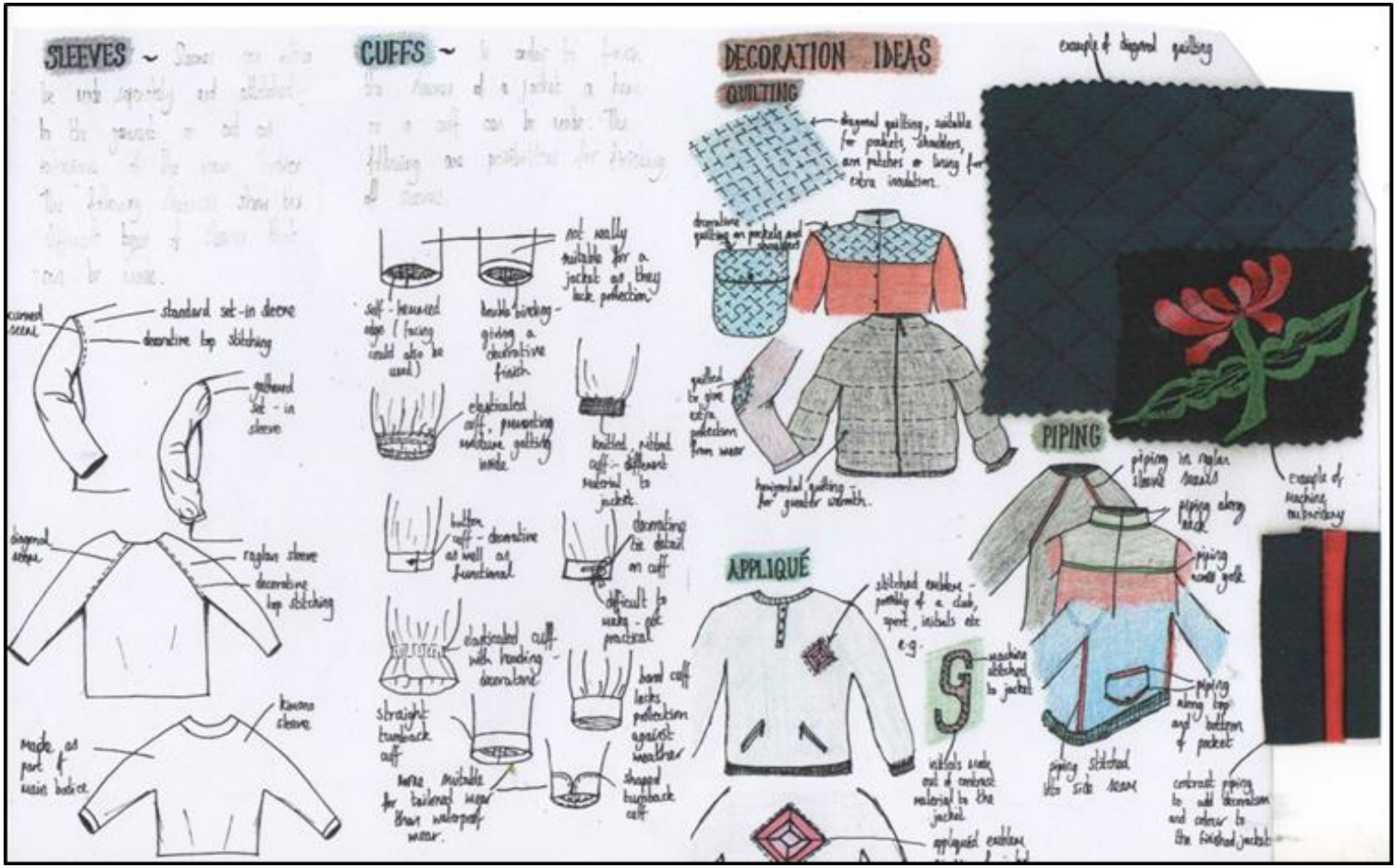
INFORMAL SKETCHPAD

- Initial ideas.
- Good concepts.
- Detailed information.
- A sound starting point.
- On-going evaluation.
- Lots of ideas rejected.
- Shape / form / aesthetics.
- *overall form/style.*

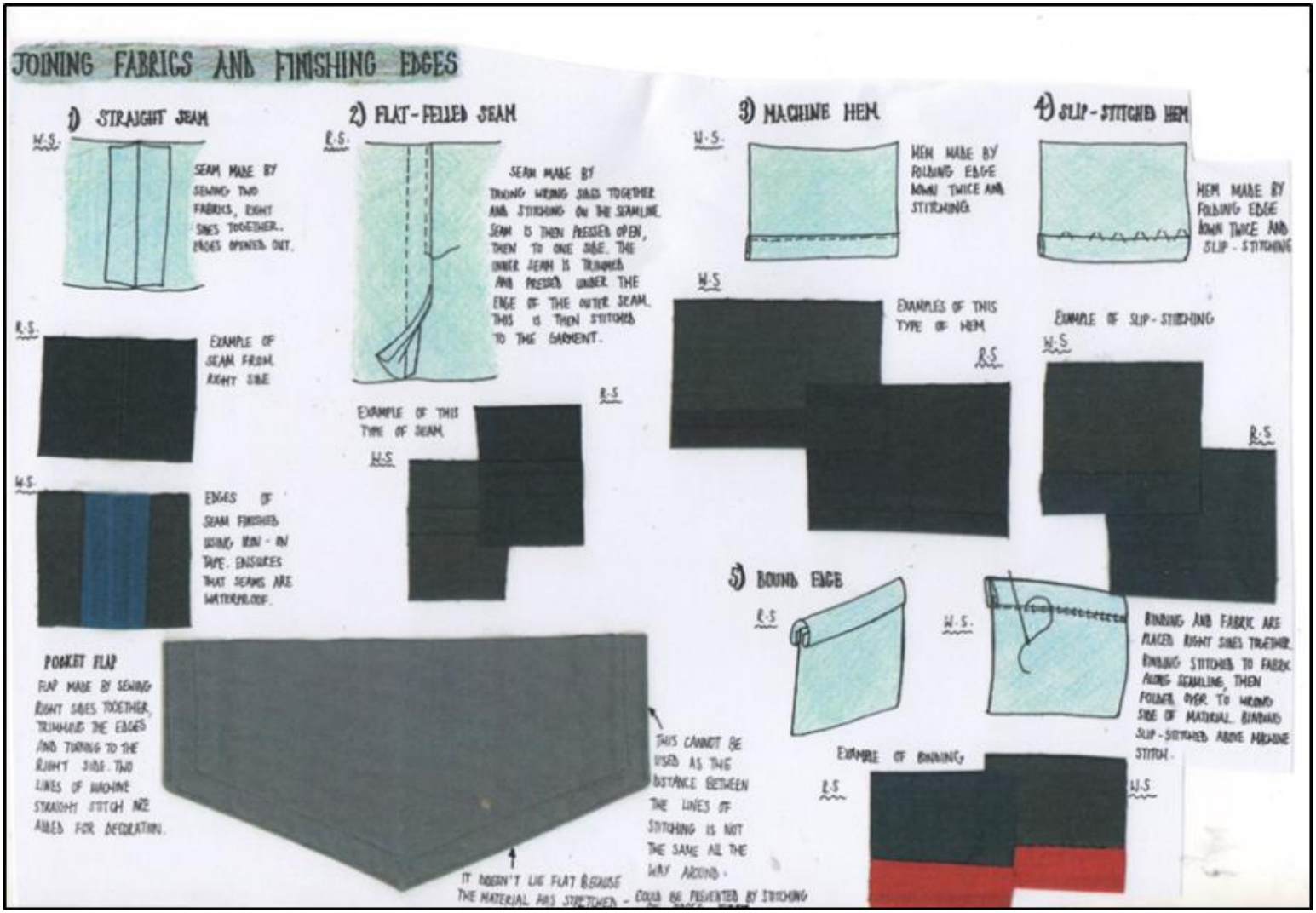
First toile – evidence of modelling could be considered at this point for



- Any starting point!
- Think, model, test, reflect.
- Variety of ideas based on Specification criteria.
- Quick developmental sketching.
- Annotation provides details.
- On-going evaluation.
- Lots of ideas rejected.
- Decision making supports developmental iterations.
- Practical testing.

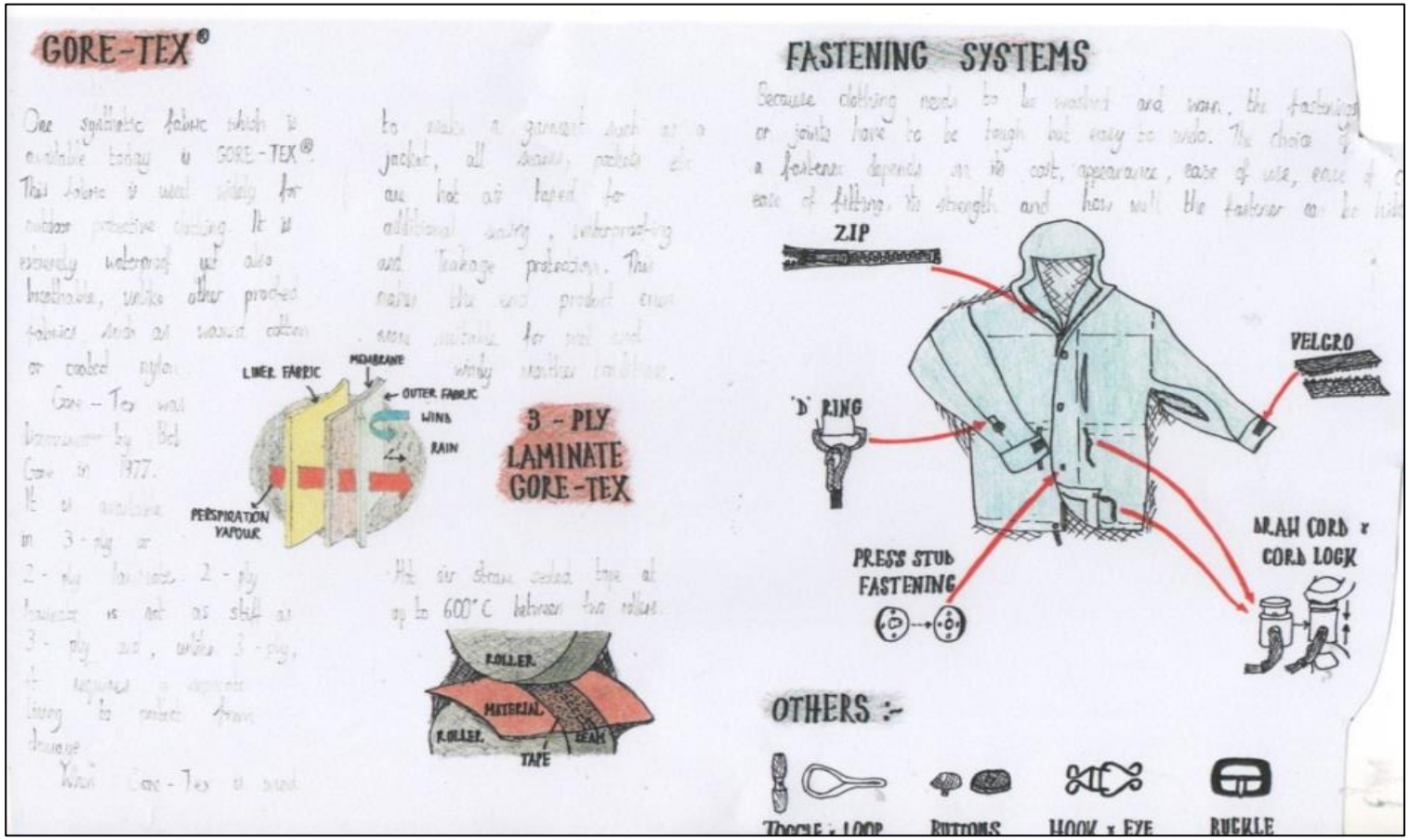


- Good evidence of modelling.
- Testing v Spec is required
- Analysis should be perceptive.
- Clear decision making.
- Consider a mix of practical activity, sketching, CAD, reflecting.
- Dynamic development!
- Lean design.

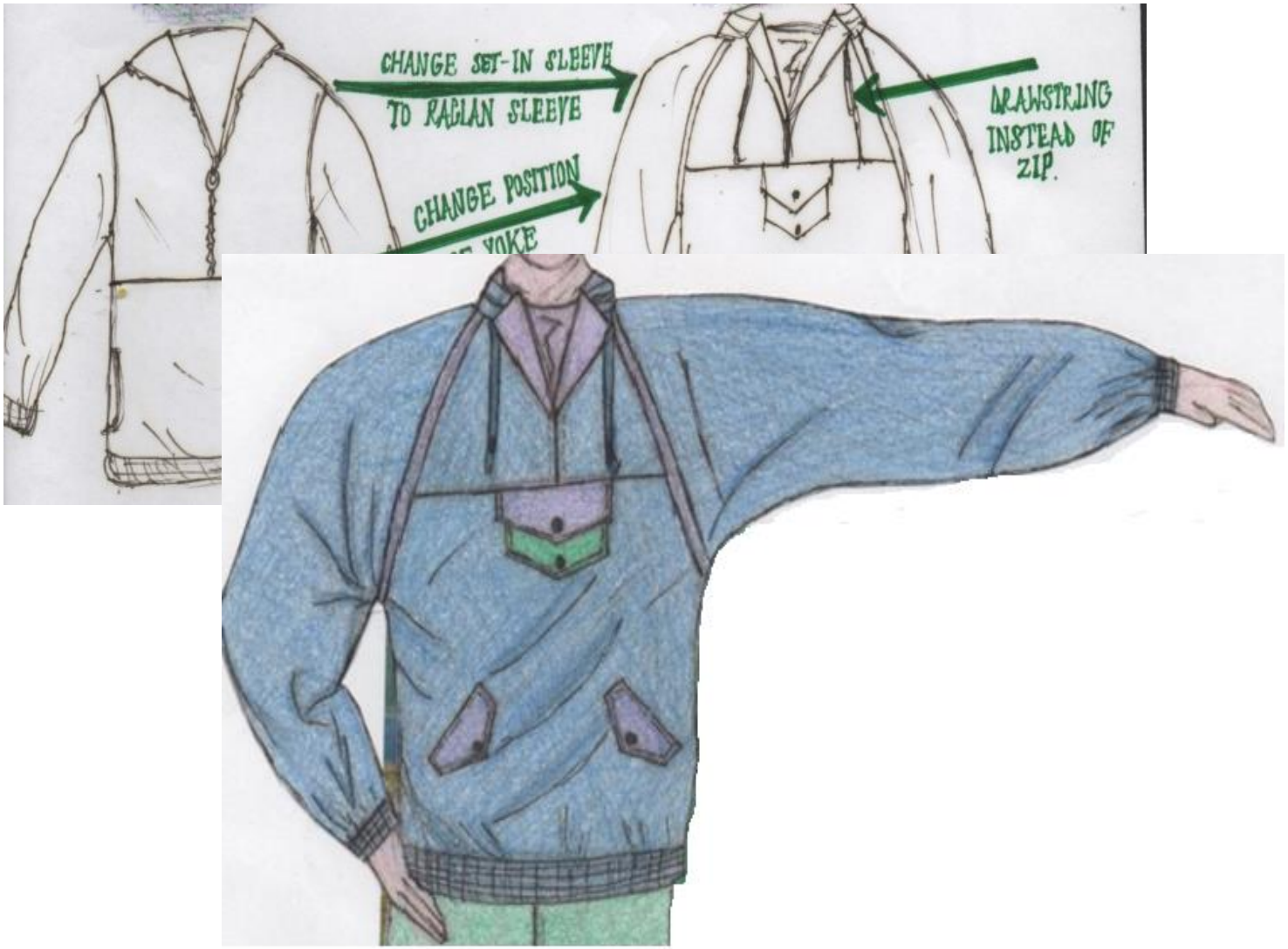


- Functional development.
- Practical testing.
- Quick sketches/ alternative methods considered.
- Focussed and relevant processes considered.
- Ideas rejected.
- Full understanding demonstrated.
- Testing leads the way.

- Functional development.
- Practical testing – focussing on relevant and suitable processes for product and materials being considered.
- Some processes will be rejected.
- Testing leads the way.
- Decorative processes could be considered – another iteration.



- Another iteration.
- Opinions of users?
- Introduce further prototyping.
- Functional/ performance testing.
- Materials choice/testing suitability.
- 3D printing of components?
- Final prototype before manufacture.

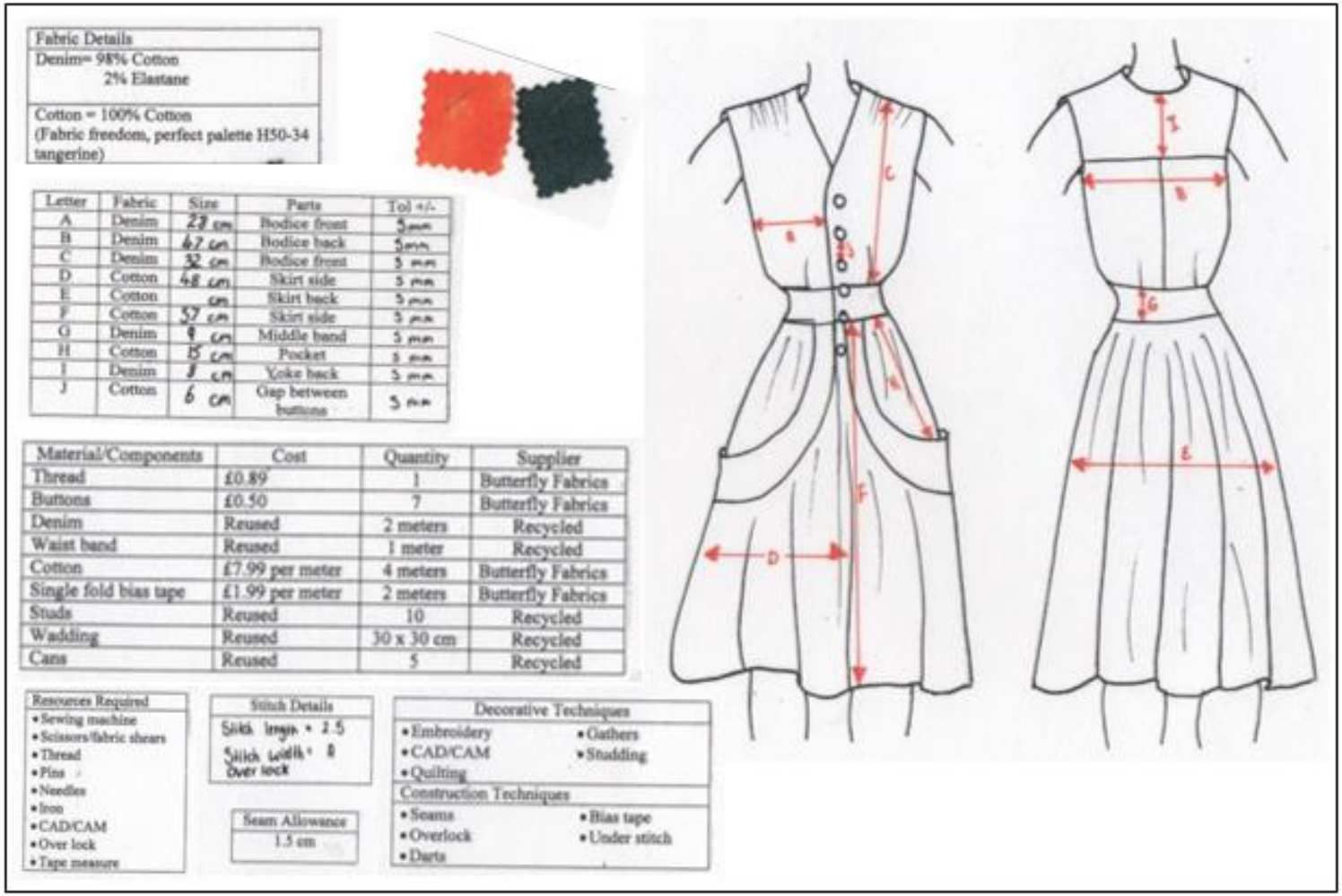


- Another iteration.
- Final proposal?
- Form/style reconsidered.
- Dimensions/size needed.
- Final prototype before manufacture.
- All important and relevant details fully analysed.

Iterative process evident albeit at a simplistic level.
Clear evidence of modelling and testing.

FORMAL PRESENTATION FOLIO

- A clear pictorial drawing of the final prototype.
- Includes front and back views.
- Hand drawn; CAD could also be used.
- High quality.
- Detailed presentation with exploded diagrams of details.
- Could a 3rd party/ manufacturer produce the prototype?



Fabric Details
Denim= 98% Cotton 2% Elastane
Cotton = 100% Cotton (Fabric freedom, perfect palette H50-34 tangerine)

Letter	Fabric	Size	Parts	Tol +/-
A	Denim	23 cm	Bodice front	5 mm
B	Denim	67 cm	Bodice back	5mm
C	Denim	32 cm	Bodice front	5 mm
D	Cotton	48 cm	Skirt side	5 mm
E	Cotton	cm	Skirt back	5 mm
F	Cotton	57 cm	Skirt side	5 mm
G	Denim	9 cm	Middle band	5 mm
H	Cotton	15 cm	Pocket	5 mm
I	Denim	8 cm	Yoke back	5 mm
J	Cotton	6 cm	Gap between buttons	5 mm

Material/Components	Cost	Quantity	Supplier
Thread	£0.89	1	Butterfly Fabrics
Buttons	£0.50	7	Butterfly Fabrics
Denim	Reused	2 meters	Recycled
Waist band	Reused	1 meter	Recycled
Cotton	£7.99 per meter	4 meters	Butterfly Fabrics
Single fold bias tape	£1.99 per meter	2 meters	Butterfly Fabrics
Studs	Reused	10	Recycled
Wadding	Reused	30 x 30 cm	Recycled
Cans	Reused	5	Recycled

Resources Required
• Sewing machine • Scissors/fabric shears • Thread • Pins • Needles • Iron • CAD/CAM • Over lock • Tape measure

Stitch Details
Stitch length = 2.5 Stitch width = 8 Over lock

Seam Allowance
1.5 cm

Decorative Techniques	
• Embroidery	• Gathers
• CAD/CAM	• Studding
• Quilting	
Construction Techniques	
• Seams	• Bias tape
• Overlock	• Under stitch
• Darts	

- Fairly detailed proposal.
- Most dimensions present.
- CAD CAM CNC data needed - if appropriate.
- Finishing techniques and processes needed.
- All material and component details needed.
- Could a 3rd party/ manufacturer produce the prototype?

Pre-production quality issues:

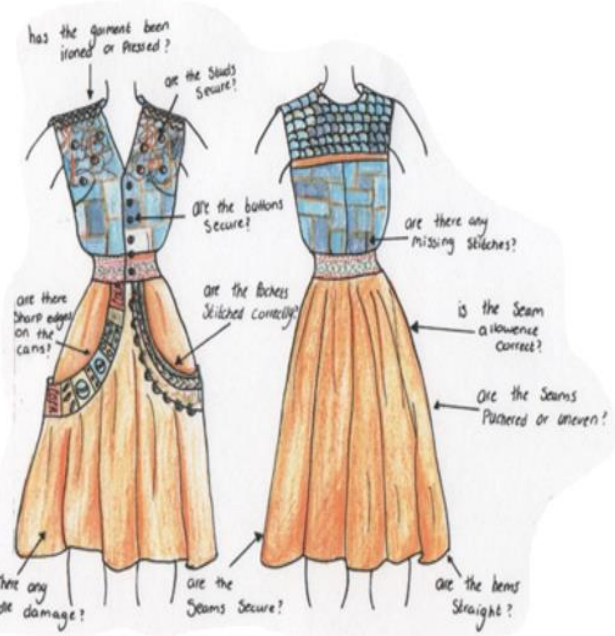
- Check materials for flaws, marks etc
- Set up machinery correctly – test.
- Check additional equipment.
- Check templates are all correct.

During manufacture:

- Lay template accurately observing pattern language.
- Transfer all pattern marking placements.
- The seam allowance is 1.5cm.
- All seams finished with overlocked edge.
- Consistent checking of stitch quality / tension.
- Match thread colours.
- Gathers should be evenly distributed.
- Symmetrical design.
- Straight hem line.
- Seams lie flat.
- Decorative panels secure.

Post production:

- Remove all pins.
- Trim threads.
- Press.



Processes need to be clearly defined: Seam finishing, hemline, fastenings, facing, patchwork etc.




- Details of decorative features needed – could be test samples to show stitch details, machine settings etc





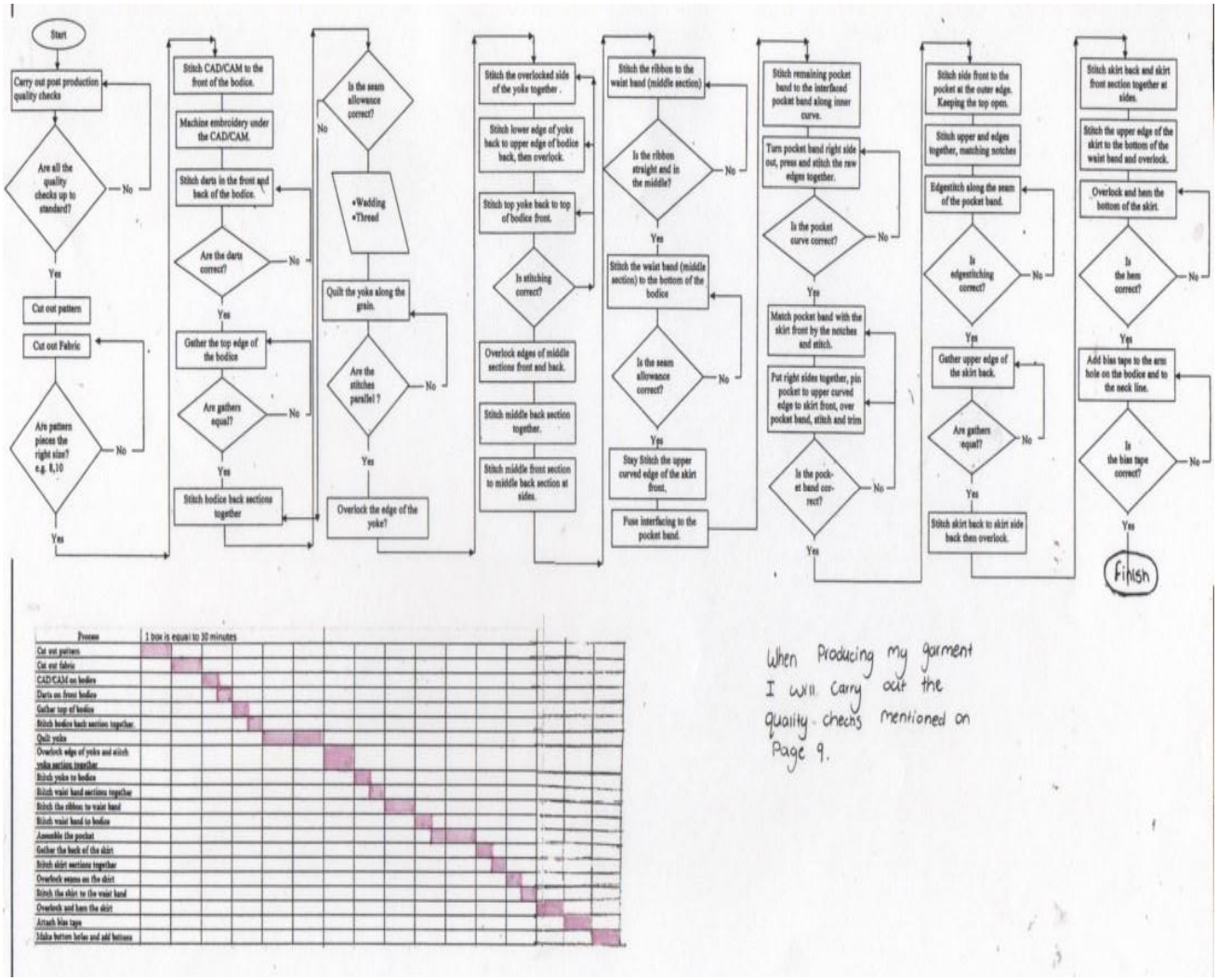
- Details of tools, equipment and making needed.
- Specialist processes.
- Manufacturing Specification.
- Quality Control factors.
- CNC/CAD CAM details speeds and settings if appropriate.
- Production information.

Band 4 Assessment Criteria – Generating and developing design ideas

- Considered a range of design strategies, techniques and approaches and applied an iterative design process to generate and communicate a broad, complex and diverse range of initial ideas.
- Identified and considered social, moral and economic factors which are relevant to the context and potential user(s).
- Clear, effective and detailed use of testing to evolve ideas and to refine their design decisions.
- Developed a detailed proposal, including comprehensive and relevant details of materials, dimensions, finishes and production techniques, which clearly address 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.

A learner meeting this assessment descriptor deserves 24-30 marks.

Assessment Criteria		Marks	Assessment objective	Guidance
(a)	Identifying design possibilities.	10	AO1	• *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	AO2	
(d)	***Making a prototype.***	30		
(e)	Evaluating a prototype's fitness for purpose.	20	AO3	
	Total	100		



FORMAL PRESENTATION FOLIO

- Details of a logical sequence.
- Achievable timeline for manufacture.
- Some processes lack depth.
- Reference to machinery is needed.
- Supports the manufacture.
- Gantt chart provides overview of time for manufacture.

Final Prototype

- High quality fully functioning prototype.
- Highly appropriate making skills.
- Excellent understanding shown.
- Specialist processes and materials used skilfully.
- High levels of accuracy achieved.
- A precise outcome.

Band 4 Assessment Criteria – Making a prototype

- Clearly communicated comprehensive and relevant details of a logical sequence and achievable timeline for the stages of production and testing of their final prototype.
- Selected and worked with appropriate materials and components to successfully complete the manufacture of their prototype to a defined schedule.
- Used a range of appropriate making skills and processes to produce a high quality functioning prototype that the requirements of the design specification and is fit for purpose.
- An excellent understanding of the working properties and performance characteristics of the specified materials and, where appropriate, demonstrated consideration of surface treatments/finishes.
- Selected and safely used 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 fully meet the user's requirements.

This learner is clearly demonstrating skills within the 24 – 30 mark descriptor.

Assessment Criteria		Marks	Assessment objective	Guidance
(a)	Identifying 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)	Making a prototype.	30		
(e)	**Evaluating a prototype's fitness for purpose.**	20	AO 3	
	Total	100		

Evaluation

My design brief was to design and make a piece of clothing which resembles Matthew Williamsons work but should also be acceptable for the summer time season. I chose to create a two – piece that would be made from bright, vivid colours which were a rich red and a luminous white. I chose to make this because they are quite fashionable and popular amongst the people who fit into my target market. Matthew Williamsons work is known for being heavily embellished or having lots of embroidery but this would be too costly and time consuming for me to add to my outfit so I decided I would add small amounts of embroidery and embellishment so that my outfit meets the requirements of my design brief. For the material of my outfit I used polyester because it is lightweight and would be cool enough to wear in hot weather and the appearance of the material added to my desired look. Although my design is rather basic, the vivid colours and dash of embroidery and embellishment really relates to the preferred style of Matthew Williamsons work. Although there are many two – pieces in the industry today I have not seen a similar design to mine.

As a whole, I am very pleased with my outfit. I am pleased with the outcome because my design had quite a few challenging processes but they do not look untidy or messy as a finished piece. As my outfit had to resemble a professional's work I have tried to use many professional finishes which has helped the outfit look neat and of good value. The strategy for writing my evaluation is that I am going to give my opinion on my finished product using the criteria I chose and outlined in my design specification. I believe my finished product does meet many of the requirement stated in the design brief but with one or two left out and I will be discussing why they were not addressed. The function of my product is for it to be suitable for summer seasons parties and events, which I believe it can be. After trying it on I can say that it is fitted to the body in the right amount and way and it is also very flattering and comfortable to wear and move in. There is a button and loop fastening on the top and a zip fastening on the shorts allowing access in and out of both pieces of the outfit. My outfit will possibly be used often but only for a short period of time and I believe the manufacturing of the product means it will be able to sustain these circumstances. Overall, I believe it meets the specification points with exception on one or two points. Below I have stated why:

Function: The outfit is designed to be worn during the summer time to parties or events meaning it may be used frequently but in a limited period of time. I made the outfit from polyester which is relatively comfortable to wear and hard wearing at the same time so that the customer can have as much wear out of it as possible whilst still providing a 'feel good factor'. One of my peers in my textiles class volunteered to try out the outfit and we both were very pleased on the fitting and how easy it was for her to move in and she felt and looked good whilst wearing it. There is a button and loop fastening on the top to allow easy access in and out of the top. I did say that the outfit had to have deep pockets to hold a teenagers essentials. This is not included on my final product as it affected the final look of the outfit and it did not look visually pleasing. As a result of this I decided that any waste material would be made into a matching clutch bag to hold a teenagers essentials.

Target Group: The outfit need to be made to suit females between the ages 15 and 19 so that it could fit in with the current trend which I believe is achieved with the finished product as I asked a handful of people within this age range and 9/10 people said they would by my item if it was seen in a shop.

Size: The outfit had to be fitted well to the size of the person wearing it which is size 10 so that it can have a positive effect on the customer. Due to the feedback of one of my peers trying the outfit on I believe that I have met this specification as she said it fitted very well and made her feel good about herself whist wearing it.

Materials: The material of the outfit must not allow itself to crease so badly that it affects the presentation of the outfit and must be suitable for washing. I used polyester to make my outfit and a small amount of cotton bias binding. Neither of these crease easily or badly unless made to do so and both can be washed easily meaning I have met this criteria.

Aesthetics: The colours I have used are white and a very vibrant red meaning that although I didn't use a wide variety of colours for it to be colourful the outfit is still quite bright and vibrant. I was meant to use a ready-made patterned fabric for some parts of my outfit although there was no material that matched my desired pattern, and any that were close were too costly to buy.

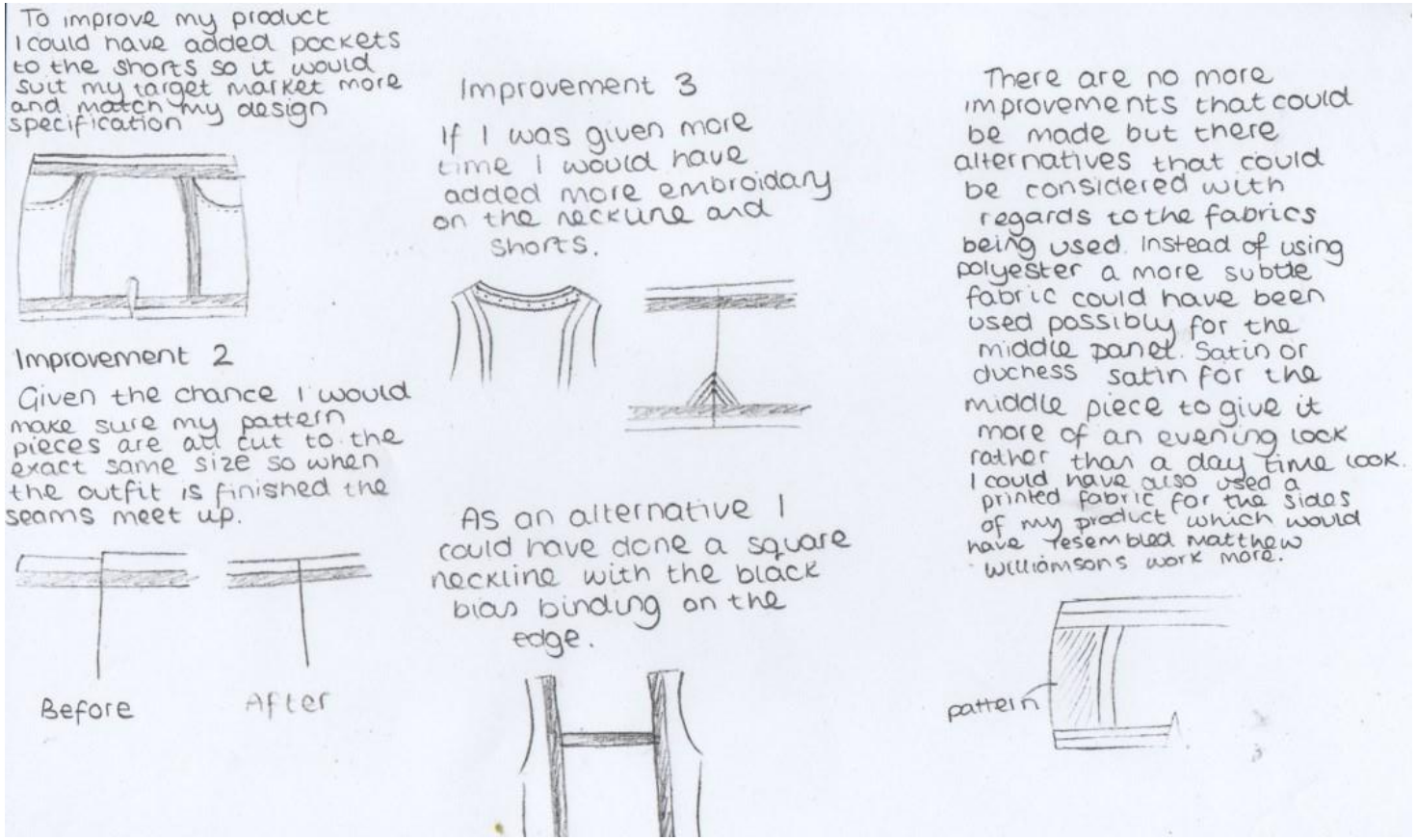
Cost: The cost of all the material and components used did not reach over £20 meaning that the outfit could potentially be sold for less than £30. This helps make it even more available to the target market.

Style: Using research I ensured that the design of my outfit fitted in with the current trends so that it will appeal to my target market which from further research I believe it does. Due to my design brief the outfit had to reflex Matthew Williamsons work and due to my use of colours and embellishment I believe I have met this criteria in my design brief and specification.

Finish: All my edges were finished with a very neat and narrow hem line to make the end product look neat and professional. None of the hems are extremely noticeable meaning I have also met the criteria for the finishes.

FORMAL PRESENTATION FOLIO

- Critical objective analysis.
- Ongoing analysis throughout designing and development.
- Final prototype testing.
- Opinions of users.



FORMAL PRESENTATION FOLIO

- Further developments.
- Respond to feedback from users.
- Modifications offered but lacking in detail.

- Undertaken a critical, objective analysis, evaluation and testing of their ideas and decisions whilst applying iterative design processes.
- Undertaken a critical and objective evaluation and testing of their final prototype, taking into account the views of potential users.
- Responded to feedback and clearly identified the potential for further development of their prototype, with detailed suggestions for how modifications could be made.

The learner does not quite meet all of the descriptors here, so cannot be awarded the Band 4 level 16 – 20 marks. The learner deserves a Band 3 mark, which fits between 11-15 marks. If there was more details in the modifications offered then the learner would just fit into Band 4.

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

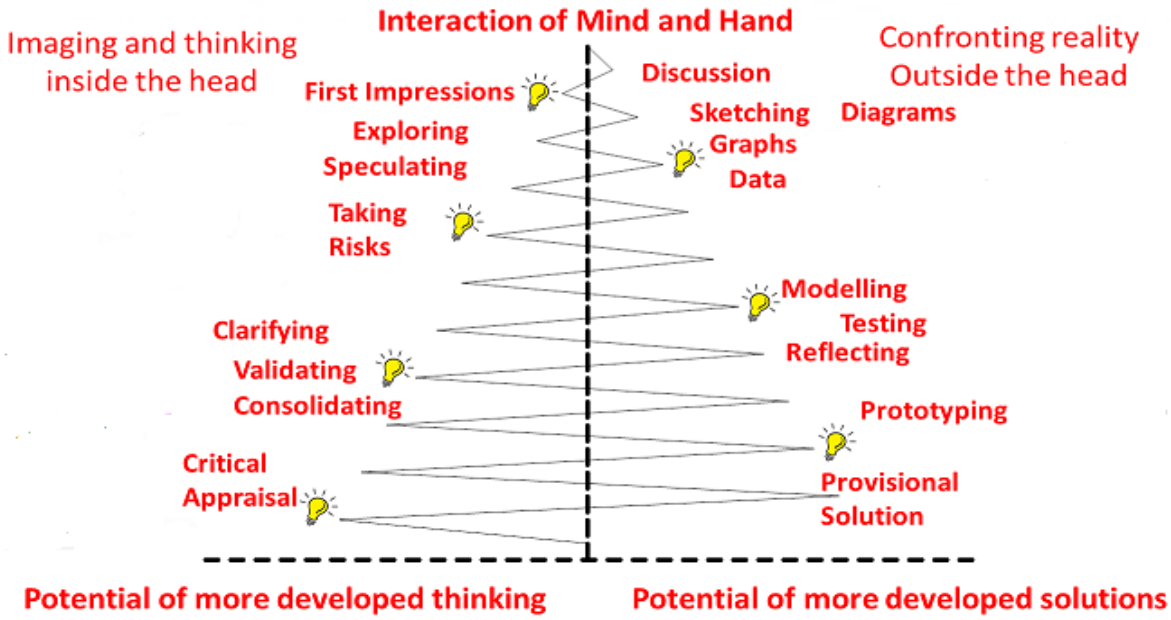
Informal A4/A3 sketchbook	Formal presentation A3 portfolio	Final prototype (fully functioning high quality product)

Detailed exemplar pages can be found on the WJEC website:

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

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

You are allowed to guide/support the learner through the iterative process. The subject teacher should check that the learner selects a problem that is appropriately challenging and provides the opportunity to address all the assessment criteria. For further details on teacher guidance please refer to pages 32-33 of the specification.

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

Written Examination: 2 hours

50% of qualification

100 marks in total

A mix of short answer structured and extended writing questions.

There are no optional questions in the examination. 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. However, extra lined pages are provided within the question paper, and further continuation booklets will be provided for learners if necessary.

Sample question

(a) Study the images of renewable energy sources shown below.

Energy Source A

© geography.co.uk. http://bit.ly/2lHwIH5

Energy Source B

Pixabay.com CC0 Creative Commons

(i) State the name of Energy Source A and Energy Source B.

Energy Source A:…….....

Energy Source B:……..... [2]

Exemplar answer

Energy Source A: Wind Farm/Wind Turbines/Wind Generators.

Energy Source B: Solar Farm/Solar Panels/PV or photovoltaic panels

These are the *only acceptable answers.*

(ii) Describe how Energy Source A is intended to generate renewable energy. [2]

.....

.....

Exemplar answers

Wind rotates the turbine which generates electricity. 1 mark

Wind rotates the turbine which generates electrical current. This is collected through a substation. The more wind, the faster the turbines rotate generating more electricity. 2 marks

Learners are required to describe Energy source A.

Locations for wind farms are critical to exploit natural resource of wind. Accept responses that include negatives such as no wind no generating energy. Onshore (as shown) and off shore farms are used. The answer must include reflect the basic process of how energy is produced in Energy source A.

(iii) Explain **two** disadvantages of using Energy Source B to generate renewable energy. [2]

.....

.....

Exemplar answers

Solar panels initial set up costs are very high.

And

Solar panels are reliant on sunny locations south facing to gain maximum exposure to sun.

There must be two explanations to achieve 2 marks. One brief answer with no explanation will only gain 1mark. Two brief answers will only gain one mark.

(iv) Explain why renewable energy sources are becoming more popular when compared with named non-renewable sources. [2]

.....

.....

Exemplar answers

Environmental awareness has increased or developed recently. (1 mark)

Legislative agreements commit countries to become more environmentally friendly. (2 marks)

We are looking to reward a detailed understanding of the reasons why harnessing 'green' energy is increasing.

(b) Many homes are now fitted with smart energy meters like the one shown below.

© MartinPrescott / getty images

(i) Explain why energy companies are offering to provide homes with smart energy meters free of charge. [2]

.....

.....

Exemplar answers

Smart meters will monitor energy use and accurately and give accurate bills. **1 mark**

The British Government is adopting smart meters to upgrade an ageing energy system and to tackle climate change, putting control in the hands of consumers. **2 marks**

The learners must have an understanding of why smart meters are being offered for use in a home used.

(ii) Discuss the impact on the consumer of having a smart energy meter fitted. [5]

.....

.....

.....

.....

.....

.....

Exemplar answers

Consumer can see how much energy is being used and can manage bills effectively. The consumer does not need to rely on estimated bills or meter readings to calculate bills because the smart meter is automatically connected to suppliers via Wi-Fi. The energy supplier can monitor energy usage and provide cheaper / better tariffs to suit customer needs, but also establish a national overview of energy usage and possibly alter tariffs or charges to make the most profit on a larger scale. 5 marks

Learners are required to discuss issues on the impact of the smart meter. Each appropriate point discussed comment would be worth a 1 mark up to a total of five marks.

Typical question

A concept bicycle lock has been designed to offer a quick release unlocking mechanism when the user scans their fingerprint.

The bicycle lock is made from hardened steel and has been dip coated with a thermoplastic powder.

Analyse how the fingerprint scanner provides benefits and limitations for users of this bicycle lock and explain why the material choice and finish is appropriate. [10]

Marks will be awarded for the content and the quality of written communication.

.....

.....

.....

Note: There are approximately 12 dotted lines in the actual question, for the written answer refer to SAMS for style.

'Analyse' is a harder style of question for the learner to answer and in this case the examiner will also be checking the quality of written communication. The response should be analysing the benefits and the limitations of the bicycle lock and in an extended essay format. The marks awarded will be based on a banded mark scheme and it essential the learners are aware that we are looking for an essay not a series of bullet points. This type of question is designed to test, stretch and challenge the more able learner. The question requires the learner to make a well-balanced argument involving both advantages and disadvantages. For this type of question analyse means examining and dissecting a situation or product giving thoughtful appropriate reasons to support the answer. It could include finding logical chains of reasoning.

No answer or no relevant issues described or discussed.	**0**
Simplistic benefits or limitations identified but not analysed. Limited understanding evident. Quality of written communication is limited or basic, presenting material with limited coherence, many errors of grammar, punctuation and spelling. The fingerprint scanner is a quick way of opening the bike lock without a key. The hardened steel will be tougher the plastic finish will protect the steel.	**1-2**
Description of some benefits and limitations, with some analysis. Some understanding evident. Quality of Written Communication is basic, presenting occasionally appropriate material with some coherence, some errors of grammar, punctuation and spelling. The fingerprint scanner is a quick way of opening the bike lock without a key. In cold weather, the user would have to remove gloves because it would be unable to scan fingerprint. The hardened steel will be tougher and harder to break or cut. The thermoplastic powder will protect the hardened steel from rain.	**3-4**
Detailed analysis of a range of benefits and limitations. Reasonable understanding evident. Quality of Written Communication is good, presenting mainly appropriate material in a coherent manner, few errors of grammar, punctuation and spelling. The fingerprint scanner is a quick way of opening the bike lock with a keyless access. The cyclist would never have to worry about the key and also losing the key would not be so problematic. One problem might be that the same person only can open the lock. This would restrict use for families or groups that shared the lock. In cold weather, the user would have to remove gloves because it would be unable to scan fingerprint. Cyclists often wear gloves for additional grip so this feature might be inconvenient. Sometimes, wet weather or muddy riders might make it difficult to scan fingerprints.	**5-7**
Clear and detailed analysis of a range of benefits and limitations. Detailed understanding evident. Quality of Written Communication is excellent, presenting wholly appropriate material in a coherent and logical manner, hardly any errors of grammar, punctuation and spelling. The fingerprint scanner is a quick way of opening the bike lock with a keyless access. The cyclist would never have to worry about the key and also losing the key would not be so problematic. One problem might be that the same person only can open the lock. This would restrict use for families or groups that shared the lock. In cold weather, the user would have to remove gloves because it would be unable to scan fingerprint. Cyclists often wear gloves for additional grip so this feature might be inconvenient. Sometimes, wet weather or muddy riders might make it difficult to scan fingerprints. The hardened steel is suitable because it will be very difficult to cut due to being harder and having increased strength. The thermoplastic coating will provide a durable weather resistant finish and prevent corrosion.	**8-10**

Unit 2 – Design and make task – Product Design

NEA – Non Examined Assessment – 50% of the qualification
Approximately 35 hours
Design and make task from a contextual challenge set by WJEC
Worth 100 raw marks
Apply the iterative process of designing

The assessment criteria for the NEA are generic, learners who focus on engineering design are more likely to undertake work which reinforces the knowledge and understanding tested in the examination paper.

NEA: A sustained design and make task, based on a contextual challenge set by WJEC, 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 a visiting moderator.

Requirements

Three contextual challenges available June 1st in the year preceding the year in which the qualification is awarded. Learners will choose to tackle **one** challenge. From the challenge the learner will investigate and decide upon possible problems/issues before deciding on a possible design task to tackle.

There will be NO SET PAGE FORMAT for the NEA.

Suggested structure of evidence required

Informal A4/A3 sketchbook

This will clearly:

- *Identify design possibilities*
- *Generate and developing design ideas.*

Note: Centres do not need purchase an A4/A3 sketchbook this does not have to be a bound book. It could simply be a series of A3 pages stapled together, or it could be a series of A3 and A4 pages bound together with a treasury tag for example. How exactly the work is presented is up to the individual centre. However, it is important to track the work and record clearly where marks have been awarded against the assessment marking criteria.

Formal presentation A3 portfolio to 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*

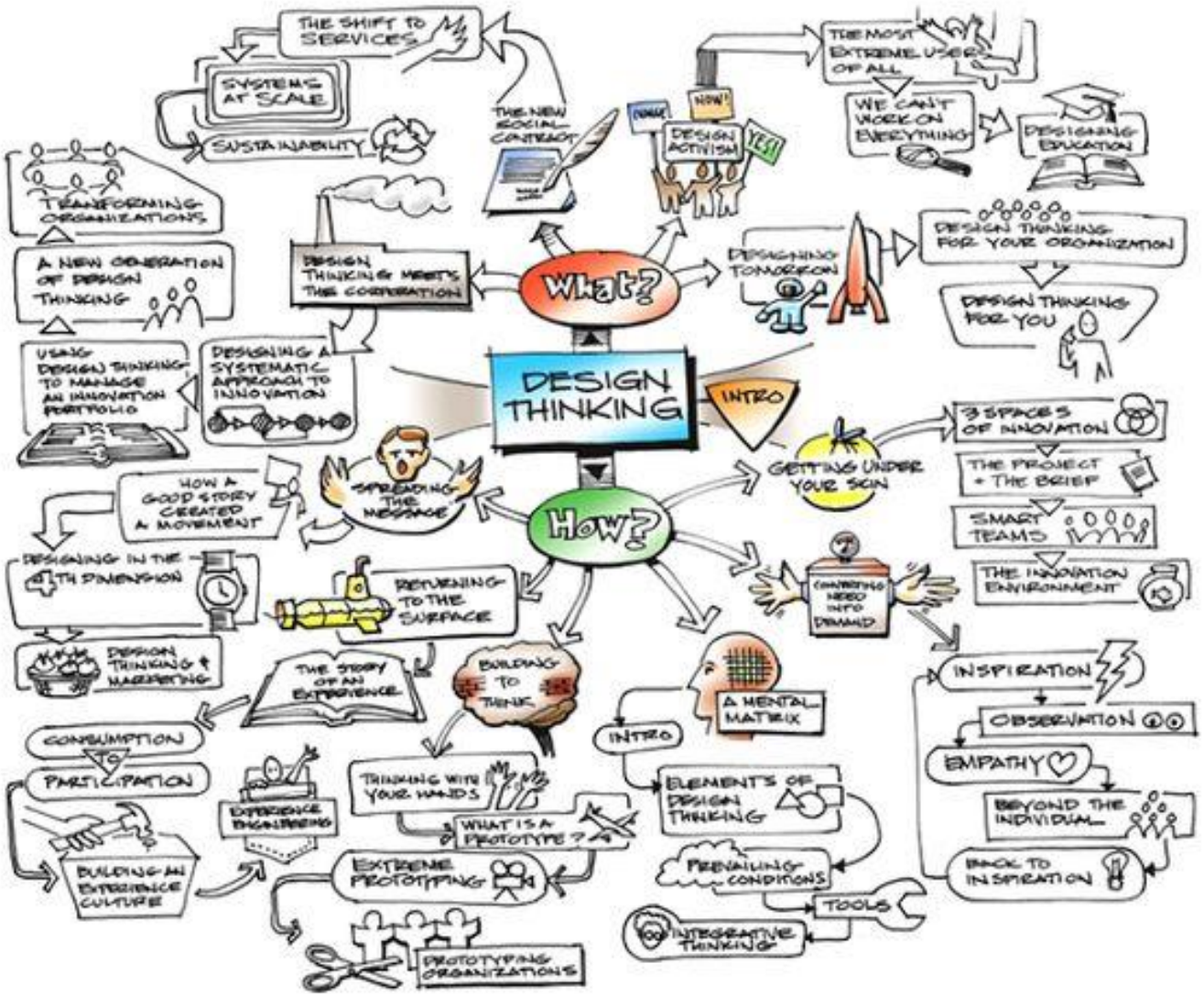
Make/practical outcomes

Final prototype (fully functioning high quality product)
You must include any supporting practical pieces including models, jigs, formers, patterns, tests, trials, iterations must be included.

Assessment criteria for the design and make contextual challenge.

Note: You do need to clearly indicate the learner's name and the centre name and number

Assessment Criteria		Marks	Assessment objective	Guidance
(a)	***Identifying design possibilities.***	10	AO1	• *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	AO2	
(d)	Manufacturing a prototype.	30		
(e)	Evaluating a prototype's fitness for purpose.	20	AO3	
	Total	100		

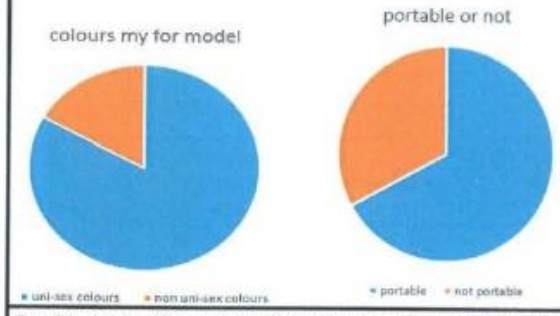


A brainstorm might be the starting point for some learners to gather their thoughts about the context. It is a good opportunity to explore the divergent possibilities within the context, and also generate important areas for further investigation/ research. Mind maps or brainstorms can allow learners to record potential ideas, questions, and tasks that can be extended at a later date, developed further during the iterative design process, or parked and not revisited.

Provide details of the **Target Market** for your product.

Having conducted a costumer survey of 100 people I have found that 95% of my customers want a docking station or music playing device that will charge their phone. I also found out that 83% of my customers would like unisex colours of the docking station such as red, black, gold or white as these colours fit in with most room colours whereas 17% preferred gender specific colours like blue and pink. I also found out 67% of people want the device to be portable, then 69% of people said they would pay between £40-£80 for such a device. I will also look at recyclable materials like timber as 79% of people surveyed said they would prefer it if the product did not harm the environment.

Ideal Customers:
Gender: Boys and Girls
Age: Teenagers
Hobbies: Listening to music, playing on Xbox/Play Station
Other Products they have: Apple iPhone, Samsung Galaxy Note, Blackberry, BEATS Headphones
Shops at: Nike shop, Adidas Shop, Amazon
Apps they use: Snap Chat, WhatsApp, iTunes, Sound Hound
My customers care about the planet and would prefer me to use recyclable or renewable materials.



BEATS PILL
RRP: £169.99 Found on Amazon.co.uk

For all this design is rounded it is very **stable** as it has a flat bottom to stop it rolling around. It features a **USB port** at the back to connect your phone with so you can play music directly from it or use the Bluetooth feature. **Being able to connect your phone means you do not have to rely on wi-fi connection making this product more portable and usable in more places. You could also charge you phone off the battery as well.** My target audience would like this as it is a unisex colour it is sleek and looks modern, I think stands out from other designs of speaker/docking stations. **The bad points are that it is expensive (£169.99) and uses mains power to charge it (to make it portable) which use energy and therefore harmful to the environment. use.**

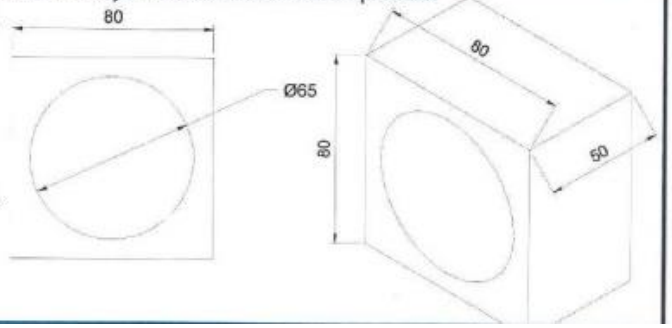
PHILIPS DS3400
RRP: £89.99 Found on Amazon.co.uk

I think my target audience would also like this docking station as it looks **high quality** made from aluminium and ABS plastic material which is scratch proof and **long lasting**, therefore they won't have to buy a new one anytime soon which could be expensive at £89.99 each. It is a **unisex colour** with a sleek design is very **modern with its curvaceous design. The negatives are that it is only compatible with iPhones and therefore people with Samsungs or Blackberry's cannot use this. However iPhone are the most popular phone brand so I may concentrate on just designing a device for this type of phone as I think I could still sell a lot and make more profit. It has a flat bottom like the BEATs Pill to give it stability and not fall over easily. I think it looks less portable than the BEATs pill because there is no obvious place to pick it up from.**

Thoughts:
From looking at these two designs, the features I like are not having any wires on show so the product looks neat and tidy and makes it more portable. I like the unusual and different shapes that make the designs stand out from traditional 'box' type designs. The Philips one looks chunkier and less portable so I will need to consider if my product should charge your phone or not as it affects the overall size if I need to allow for somewhere to stand the phone securely.

Provide details of the results of the **Research** that you have carried out into the problem.

I have completed a customer survey (results above) and have also taken apart an existing product to find out sizes for components like speakers and circuit boards. I have found out that the circuit board and battery pack is 55mm x 65mm and the speaker has a diameter of 65mm and depth of 25mm so my docking station must be between a minimum of w80mm x h80mm x d50mm to hold the most basic components. As long as my design fits these it will work, the smaller it is the more portable it is so I think it should be no more than h250mm x h250mm x d100mm to sit on someone's desk and not look too big.



State your **Final Design Brief** here.

I have decided to design a portable docking station that charges your phone while playing music. It will be compatible with the iPhone 5c, 5s, 6 and 6+ as they all have the same charge pin and connector at the minute and are the number one selling mobile phone. The design will have unisex colours to appeal to boys and girls and will be innovative in some way through the use of new technologies to make it or as part of the features/functions. It must fit within the minimum and maximum sizes I have said (left).

The design will be sleek and modern and have an unusual shape to make it stand out from its competitors.

I will be creating a product which appeals to both genders from the age of 18 onwards. I will be priced at a cost of around (£9.99 - £15.99) which is affordable for the average person who cares about the environment. As this product is solar powered which makes it a more economical way of drying clothes by saving energy from sources such as radiators and tumble dryers. It will apply to homes with washing lines as this product is aimed at people who dry their clothes outside everyday. It will also help the consumer around the house as you will not have to worry about rain affecting your clothes because the alarm will trigger to alert them.

I have been carrying out research on the internet to look for a product on the market that have the same purpose as the one I am going to make. Now I currently nothing which is specifically designed for a washing line that alerts you that it is raining outside, this means that my product is a unique design which no one has thought of or made, meaning there is space for it on the existing market.

design a product which is 8x3x3 cm meaning it is

The competitor product I have chosen to analyse is aimed at visually impaired users to help safely fill a glass or mug without spilling. ~~It is RNIB approved~~ which means it is a safe product ~~to use~~ it is priced at £41.03 which isn't affordable to everyone as it is highly priced. ~~The product is very small with~~ the dimensions of 4.8x5.1 inches in length which makes it easy to carry and portable. It is a very basic design but the bold orange colour makes it appealing to customers. The battery and wires are also on show and easy to access so it is a hazard around small children which isn't appealing. It is powered by a 9v battery ~~and it is~~ not the most economic or sustainable way as you will have to keep changing the battery compared to solar power which is ~~economic~~ and constantly powered.

The competitor product I have chosen to analyse is aimed at visually impaired users to help safely fill a e.g. glass or mug without spilling. It priced at ~~£41.03~~ ~~which is affordable for everyone as it is highly priced~~ and for a basic product it is highly priced. It is injected moulded ABS which is thermoplastic meaning it can be recycled into another product when finished. It isn't a very attractive product but it's bold orange colour makes it appealing to customers. ~~The battery and wires~~ It is RNIB approved but has doesn't contain a CE sign meaning it cannot be sold in the U.K. I believe the reason for this is the wires and battery are easily accessible, ~~which is~~ if the water does ever flow the product isn't waterproof so it could become a hazard when turned on as it could ~~electrocute~~ affect the internal circuit board. ~~The product~~ It is powered by a 9v battery which isn't a very sustainable ~~or economical~~ way because when the battery

~~the~~ runs out you can't dispose the battery in a household bin, where as if it was to be powered by solar then the products battery would be constant and wouldn't need to be changed

Both pages indicate research into existing products, with the evaluation of features of existing designs on the market. The second page does lack images to support the written text but there is evidence of analytical thought within the body of the text. There is analysis of information rather than just the presentation of information. Learners are reminded that their evaluation and analysis of the research is the most important factor, not simply presenting raw research results.

Band 4 Assessment Criteria - Identifying design possibilities

- Undertaken thorough and effective identification of opportunities for the development of designs within the prescribed context.
- Undertaken detailed, relevant research and investigation, clearly linked to the context and, where appropriate, the work of past/present professionals and companies.
- Undertaken detailed and effective analysis of information, reflecting the needs, wants and values of clients or potential users.
- Identified a broad range of problems/opportunities to clearly inform the development of possible design briefs.

Learners meeting the four descriptors from Band 4 of the marking criteria deserve 9-10 marks.

Assessment Criteria		Marks	Assessment objective	Guidance
(a)	Identifying design possibilities.	10	AO1	• *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	AO2	
(d)	Making a prototype.	30		
(e)	Evaluating a prototype's fitness for purpose.	20	AO3	
	Total	100		

Size

- The product must be portable so it should be no bigger than H300mm x W250mm x D100mm. I intend to test this by using a ruler.
- To be portable it must be no more than 2kg in weight to make it easy to carry.
- It must be no smaller than H80mm x W80mm x D50mm to be able to hold all the electronic parts.

Safety

- To avoid being injured I will include a manual that states and tells you all the possible hazards on the device or alternatively a sticker on the bottom in case you throw it away accidently. It will include a picture instructions, and possibly brail, for those with visual impairments.
- There will be no sharp corners or edges.
- Battery operated so the customer won't get electrocuted.

Function

- It will be an innovative design which will stand out to customers compared to the other mp3 players/docking stations.
- On the other hand there must be an easy access slot for the batteries so that if they die the customer can replace them without any stress or difficulty.
- Must play music clearly via your phone.
- It must use Bluetooth technology and be compatible with all mobile phone brands.
- It must play music clearly and be able to vary the volume.

Materials

- It is essential that the product is scratch and water resistant like the products analysed on page 1. I will test that by splashing water on my speaker and rubbing hard materials on the product. It must be water resistant so that it can be used in kitchens, bathrooms and outdoors.

Target audience

- Male or female between the ages of 15 years old to 50 years old.

Environment

- The materials I will use are going to be sustainable as my target audience value products that are recyclable or reusable.
- To avoid from the wire or speaker ending up in a landfill, I am going to design the product so that it can be taken apart so the circuit and speakers could be reused by going into another product.

Aesthetics

- Must use a neutral colour palette to appeal to widest range of target audience.
- Must be an unconventional shape.

Cost

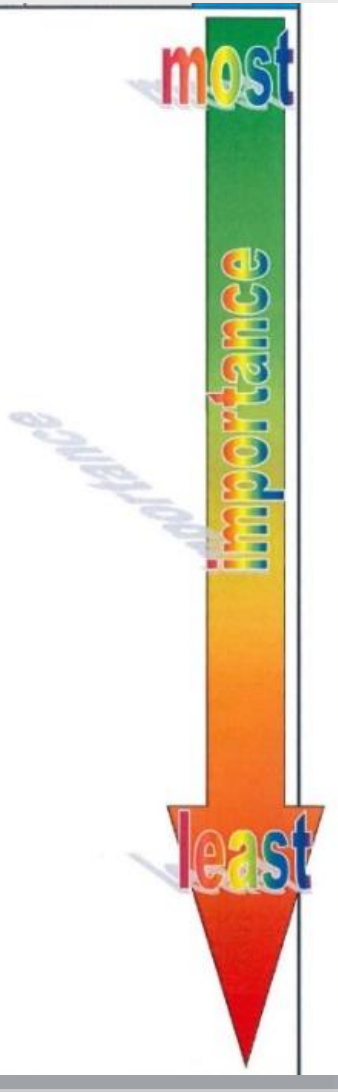
- Must sell for £50 or less to be affordable to the target audience.

Manufacture

- The product will be made using CAM to achieve accuracy and high quality finish.
- Must demonstrate innovation in manufacture by using new technologies such as laser cutting.

Moral social spiritual cultural issues

- My design is will not be offensive to any culture, spiritual following or religion in its design.
- I will consider social groups of people who do not have much money and I will try to make it affordable to buy.



I have decided to design a portable docking station that charges your phone while playing music. It will be compatible with the iPhone 5c, 5s, 6 and 6+ as they all have the same charge pin and connector at the minute and are the number one selling mobile phone. The design will have unisex colours to appeal to boys and girls and will be innovative in some way through the use of new technologies to make it or as part of the features/functions. It must fit within the minimum and maximum sizes I have said (left).

The design will be sleek and modern and have an unusual shape to make it stand out from its competitors.

A clear final brief is presented as a result of the detailed, relevant and focussed research, following the consideration of a number of possible design tasks.

The specification must be used as a design tool, and any ideas, models, tests; initial prototypes must be evaluated against the specification criteria. There are important features used as headings with multiple statements within each heading to 'split' up the success criteria into manageable aspects. There is a hierarchy of importance.

Band 4 Assessment Criteria - Identifying design possibilities

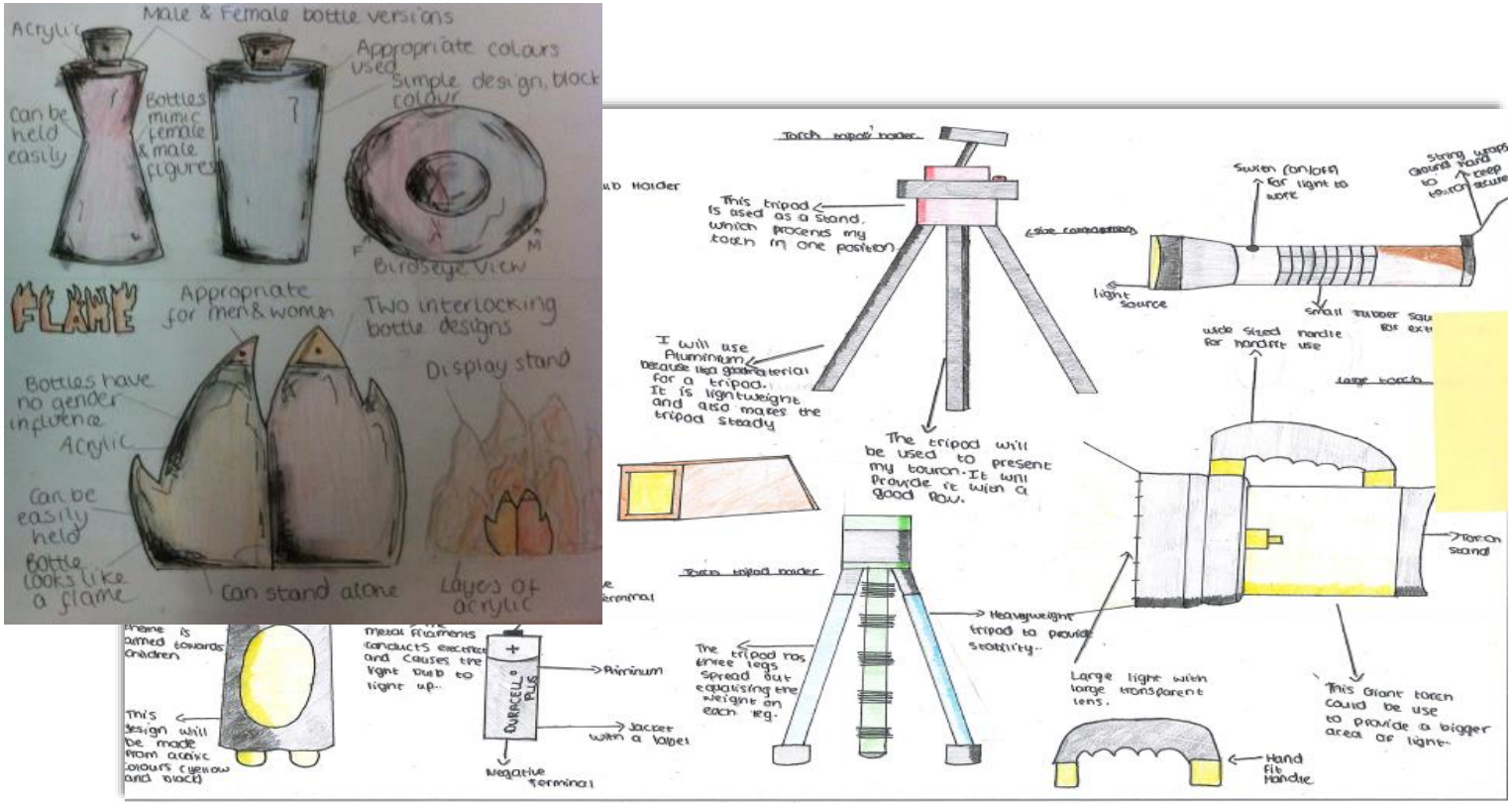
- Undertaken thorough and effective identification of opportunities for the development of designs within the prescribed context.
- Undertaken detailed, relevant research and investigation, clearly linked to the context and, where appropriate, the work of past/present professionals and companies.
- Undertaken detailed and effective analysis of information, reflecting the needs, wants and values of clients or potential users.
- Identified a broad range of problems/opportunities to clearly inform the development of possible design briefs.

Where a learner meets the four descriptors from Band 4 of the marking criteria deserve 9 -10 marks.

A learner who meets the descriptors above deserves to be awarded 9 -10 marks in Band 4.

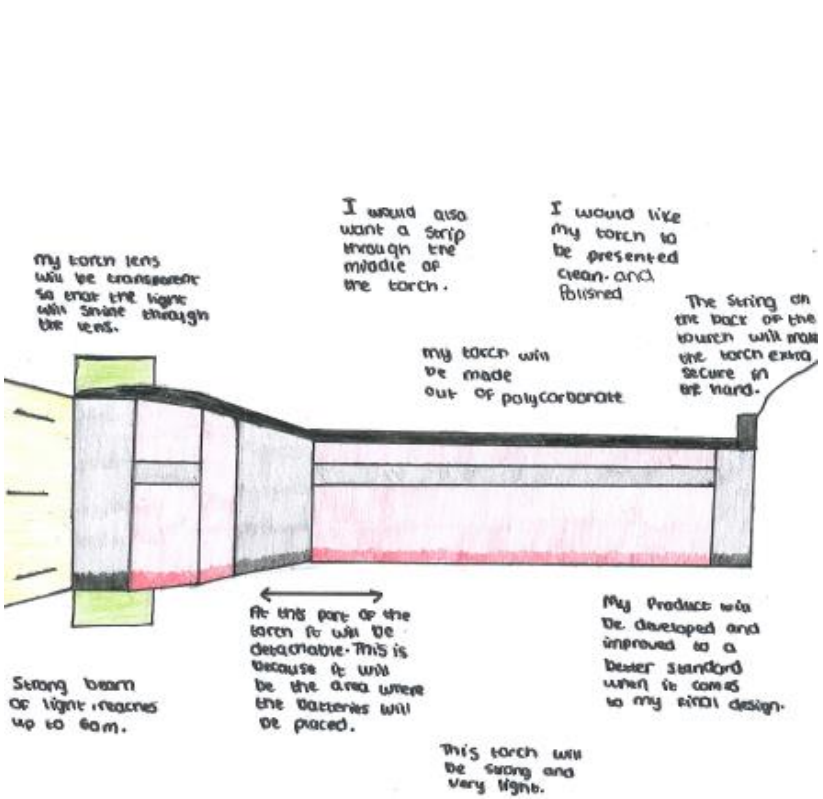
Assessment Criteria		Marks	Assessment objective	Guidance
(a)	Identifying design possibilities.	10	AO1	• *30% of the NEA* • *An iterative approach is required.* • *A range of design strategies.* • *Clear and effective testing.* • *Analysis against specification identifies further refinements.* • *Testing 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	AO2	
(d)	Making a prototype.	30		
(e)	Evaluating a prototype's fitness for purpose.	20	AO3	
	Total	100		

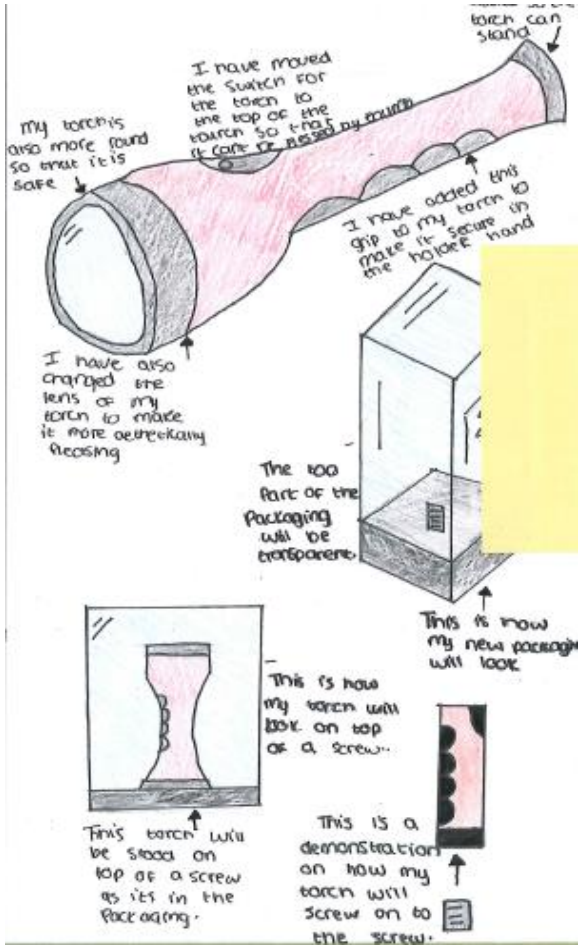
This aspect of the NEA represents a large mark allocation, and there will need to be a variety of types of evidence to achieve high marks here. The iterative approach must allow learners to 'unpick' the problem and begin to come up with possible ideas for parts of the potential solution. There must be a clear 'think, create, test, evaluate' cyclic approach to the activities that learners undertake as part of their generating and developing of design ideas. This culminates in the presentation of the final prototype.



INFORMAL SKETCHPAD

- Initial ideas.
- Basic concepts.
- Scant information.
- Starting point.
- Lots of ideas rejected.
- Shape/form/ aesthetics.





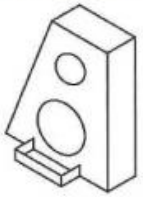
- Any starting point!
- Think, model, test, reflect.
- Variety of ideas based on Specification criteria.
- Quick developmental sketching.
- Annotation provides details.
- Decision making supports developmental iterations.

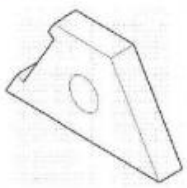
This was my original design for my docking station but I felt is was impractical and also risked health and safety as the **sharp spike** at the top would be to easy to impale your self on. Also it was **not that supportive of the phone by not having much of a gradient to place the phone on and nothing on the sides to stop the phone falling off the sides this made the phone susceptible to damage.**

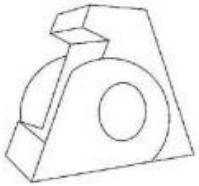
Speakers
I also designed some different speaker designs for the hole in the middle..

If the holes are too big they will let water in if it is used in a bathroom and damage the electrics, if they are too small no sound will come out!

I like this one because it looks like the dots are bursting out





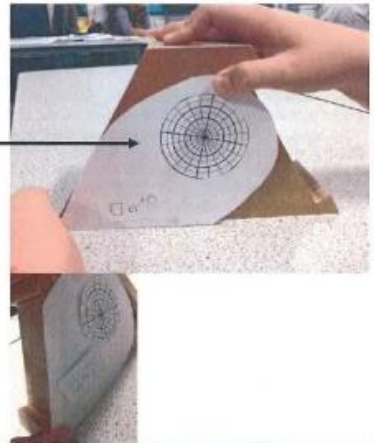


Technology
If I add Bluetooth any phone could connect to the dock but I am basing the size of the dock area around the iPhone 6 as this is the largest of the iPhones and the top selling phone at the minute (most people have one). Puting all the connectors for different phones on will start to look messy and untidy and therefore not sleek my customers want.

Speakers 2
I like this design as it is symmetrical and will work well with my round speaker hole.

My sketches from my design ideas show how I changed the shape to make it more **sturdy** and hold the iPhone better by adding sides and making the base wider. **The sides could easily be made from laser cut acrylic**. Acrylic comes in lots of different colours in school so I will start to consider this in my design as it develops. The only negative is that there is no obvious handle to pick this up by but if I make it lightweight enough that will not matter.

I used the blue Styrofoam to make multiple designs for my docking station sides.
Because I want the curve to hold the phone I tried lots of different cuts. To make sure I didn't prefer the straight edges like the 1st and 2nd sketch, I tried using just straight edges which is what the picture shows, but I prefer the curve as its more unique and will appeal to teenagers more I think.

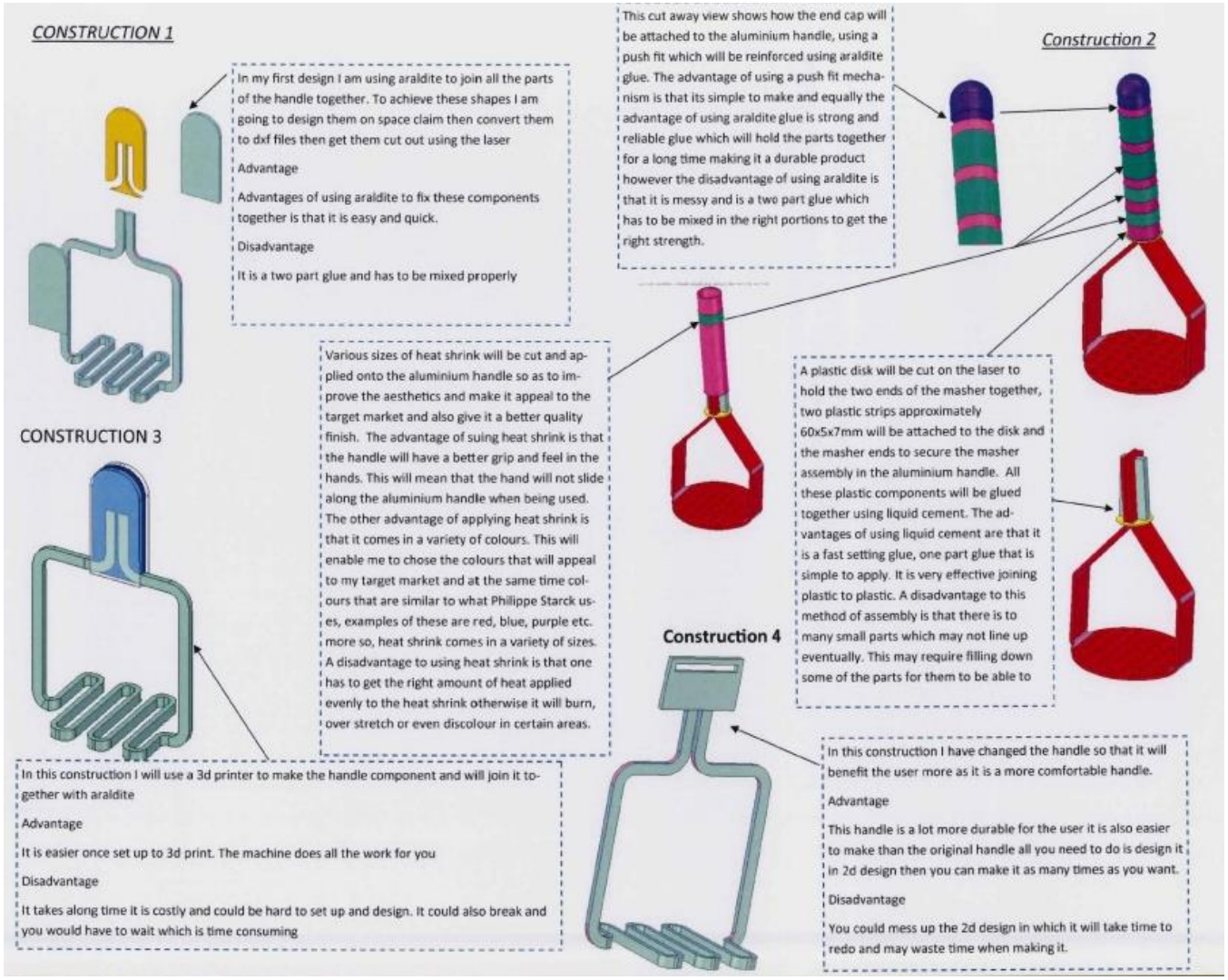


Here I am developing the shape of the curved side using a paper template. I checked it against paper cut outs of the speaker and controls to make sure it all fits.

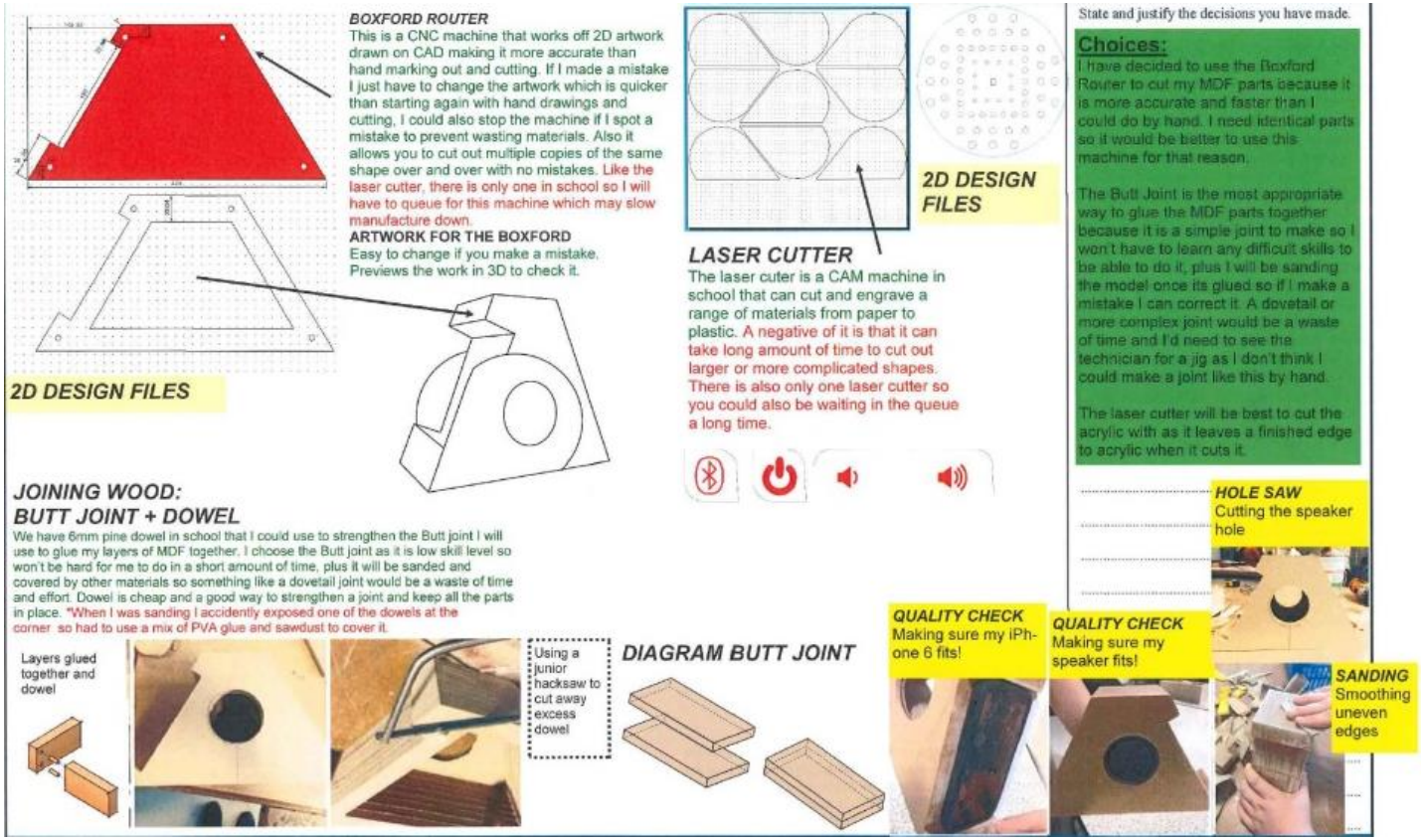
I constantly need to check that the iPhone 6+ fits the design as this is the biggest phone size.

Speakers 3
I also like this design because it looks like the wi-fi symbol which is a modern technology. But I think it also looks like a sign from science and might put people off and I think it looks like it will appeal more to boys because of this danger element, so I prefer option 1.

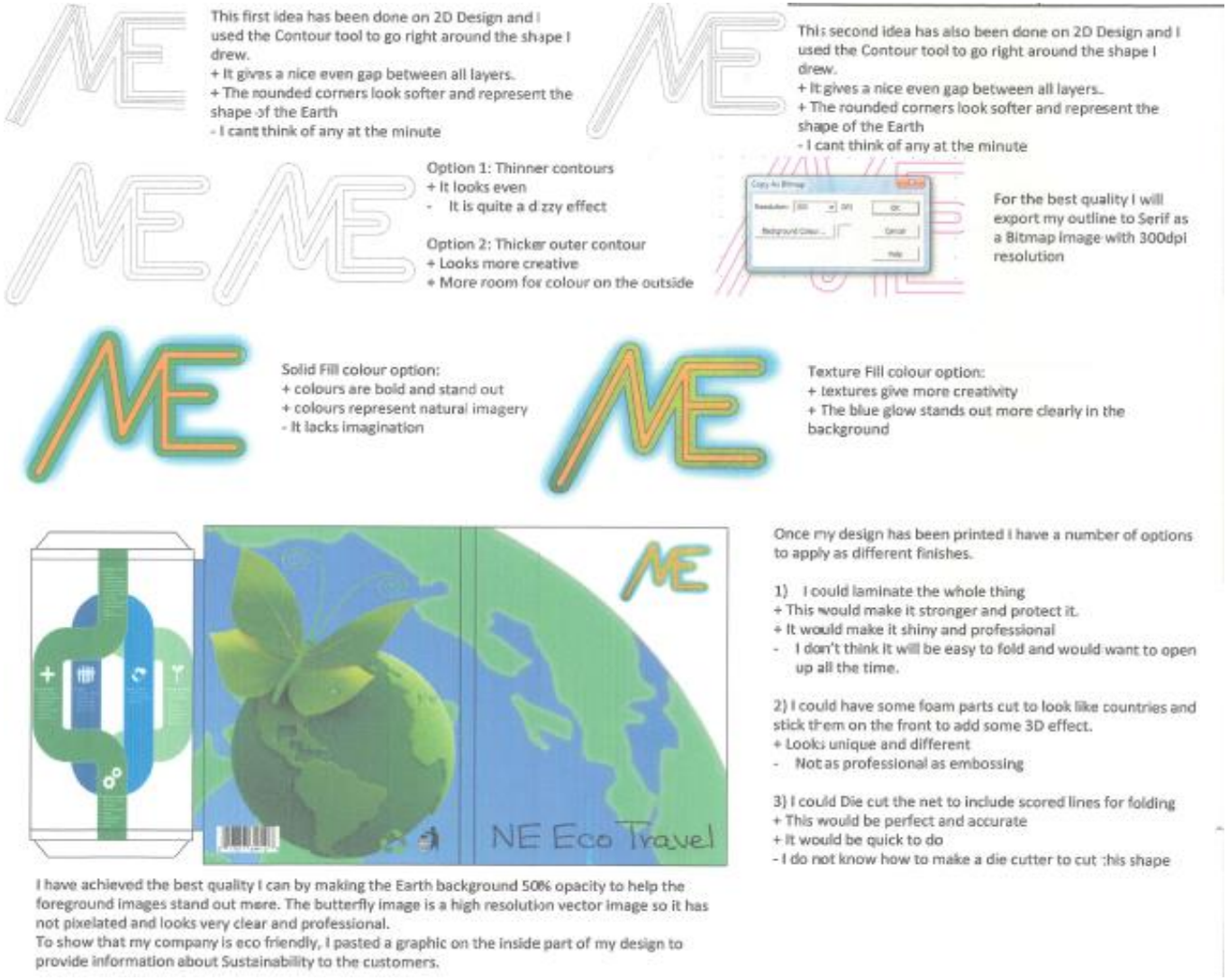
- Good evidence of modelling.
- Testing v Spec.
- Analysis is perceptive.
- Clear decision making.
- A mix of practical activity, sketching, CAD, reflecting.
- Dynamic development!
- Lean design.



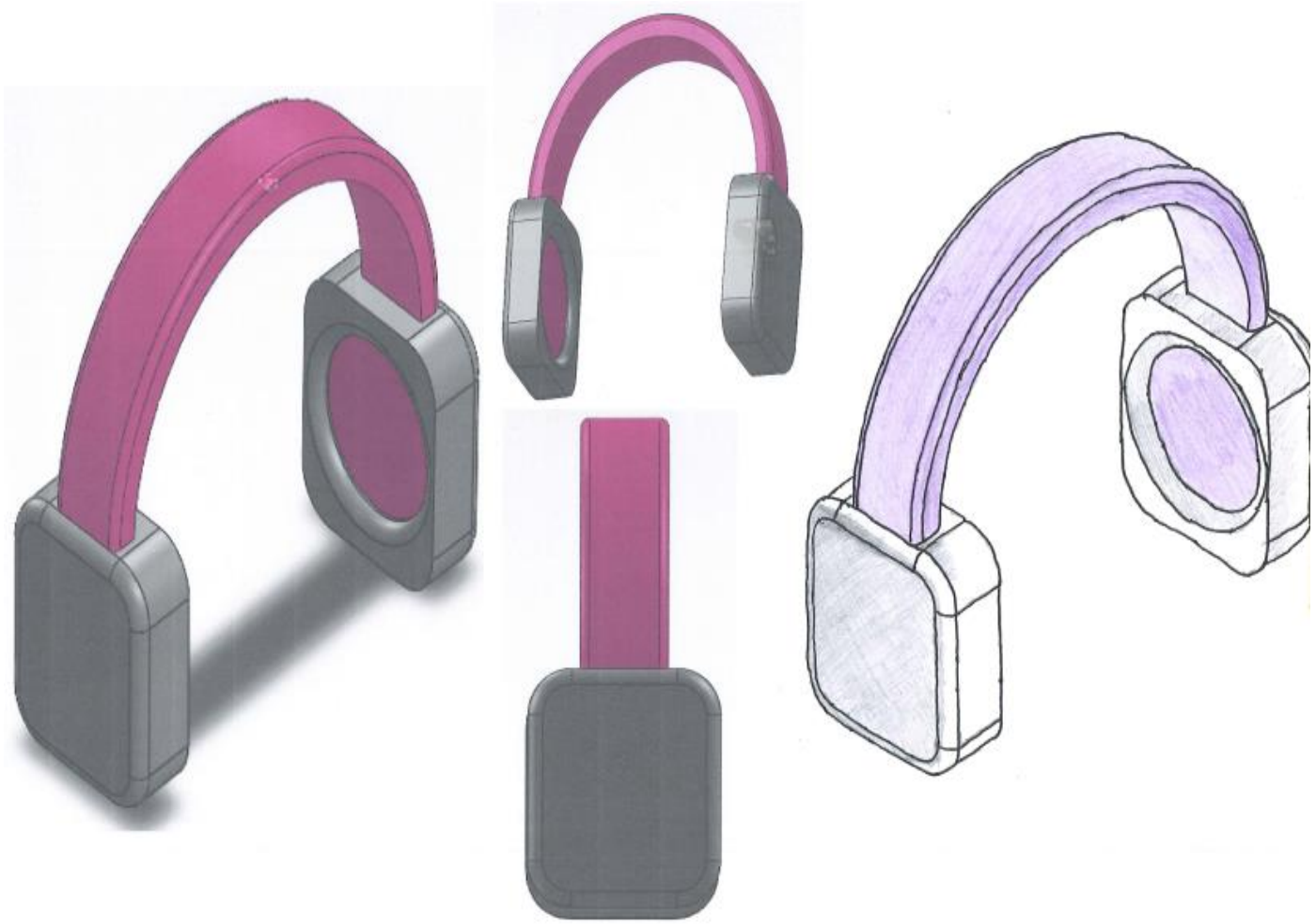
- Functional development.
- CAD used effectively.
- Analysis supports change.
- Physical testing.
- Full understanding demonstrated.
- Testing leads the way.



- Re-think based on testing and outcomes.
- Opinions of users?
- Introduce prototyping.
- Solid modelling.
- CAD/simulations
- Functional/performance testing.
- 3D printing.

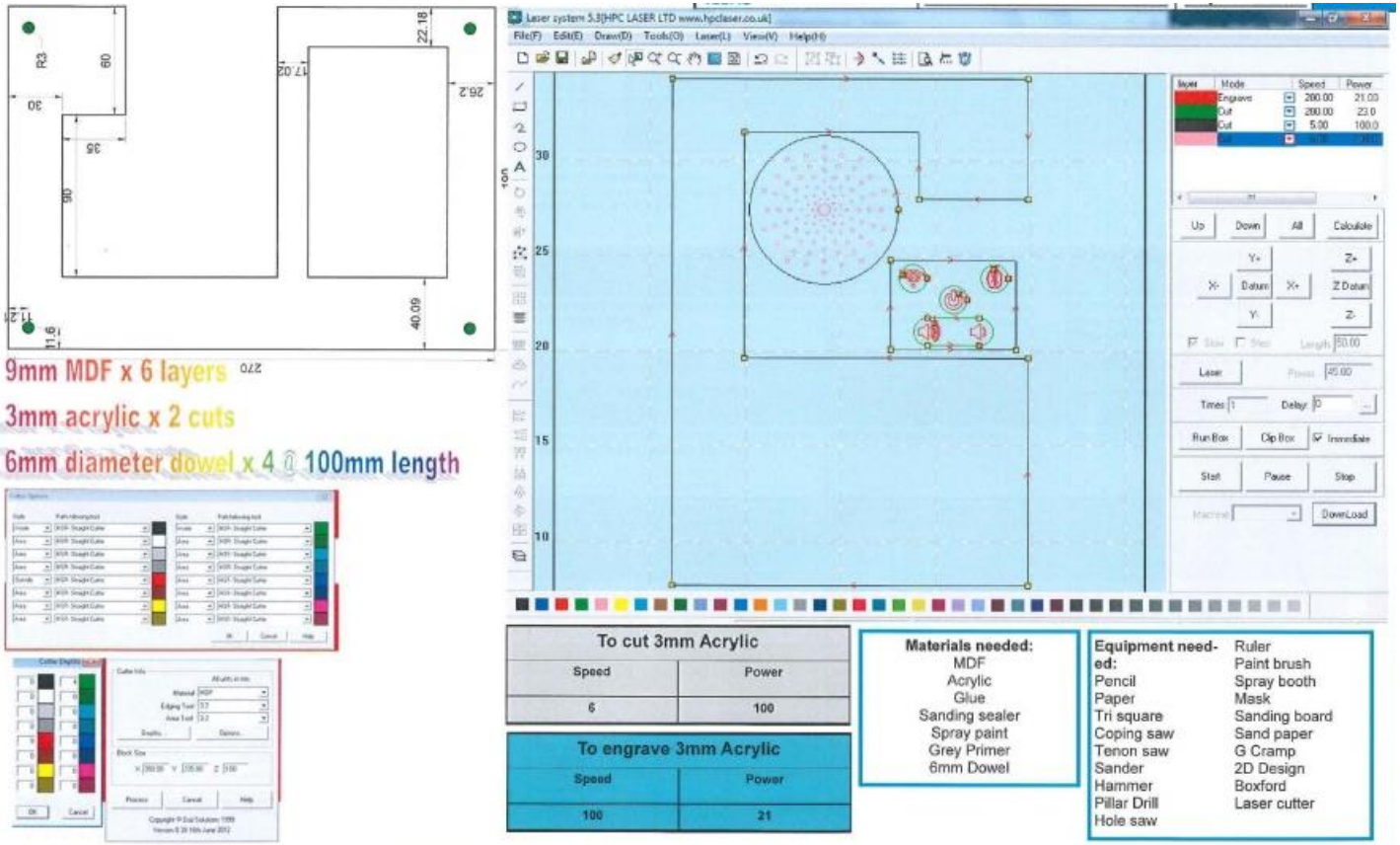


- Another iteration.
- Construction considered
- Sizes being considered.
- Logo/branding considered.
- Further functional development



FORMAL PRESENTATION FOLIO

- A clear pictorial drawing of the final prototype.
- Hand drawn/CAD.
- High quality.
- Detailed presentation.
- Could a 3rd party/manufacturer produce the prototype.



- Detailed proposal.
- All dimensions present.
- CAD CAM CNC data.
- Finishing techniques.
- Could a 3rd party/manufacturer produce the prototype?
- Sophisticated skills evident here.

Band 4 Assessment Criteria - Generating and developing ideas

- Considered a range of design strategies, techniques and approaches and applied an iterative design process to generate and communicate a broad, complex and diverse range of initial ideas.
- Identified and considered social, moral and economic factors which are relevant to the context and potential user(s).
- Clear, effective and detailed use of testing to evolve ideas and to refine their design decisions.
- Developed a detailed proposal, including comprehensive and relevant details of materials, dimensions, finishes and production techniques, which clearly address 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.

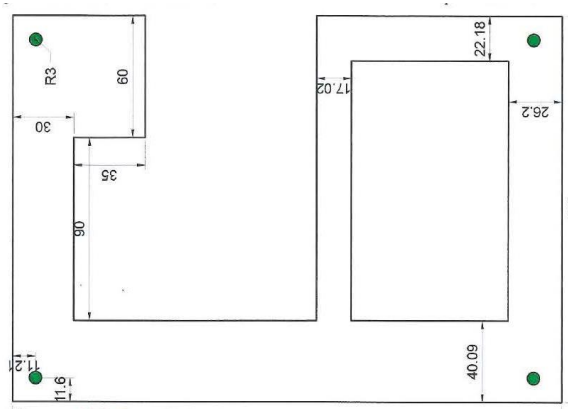
A learner meeting this assessment descriptor deserves 24-30 marks.

Assessment Criteria		Marks	Assessment objective	Guidance
(a)	Identifying design possibilities.	10	AO1	• *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	AO2	
(d)	***Making a prototype.***	30		
(e)	Evaluating a prototype's fitness for purpose.	20	AO3	
	Total	100		

There must be evidence of a clear plan of making with supporting annotation discussing issues such as quality assurance, quality control, time, materials, finished sizes etc.

Task	Time	Materials needed	Tools needed	Potential problems	Quality check	Health and safety
Export artwork to the Boxford router to be cut out x9.	30mins	9m MDF	2D Design, Boxford	Cutting depths may not be set correctly. Might have to alter artwork.	Put all the layers together to make sure they are all the same size and line up. Use 3D simulation tool on Boxford Router to check artwork.	Must be supervised when using Boxford.
Glue MDF layers together using Butt Joint (see page 7).	20mins 24hrs drying time	6mm pine dowel and PVA glue. MDF layers	G Cramp	PVA glue could cause wood to swell. Excess glue needs wiping away. Dowel rod holes marked too close to edge on artwork, weakens the joint.	Clamp pieces together with enough force to ensure layers stick together. Remove excess glue. Clamp together using scrap MDF between G Cramp and model.	N/A
Cut excess dowel rods.	10mins	MDF model (glued)	Bench vice Coping saw	Dowel may snap in joint and require filling.	Sand back where dowel rods were.	Keep fingers back when sawing.
Sanding	10 minutes	MDF model	Belt Sander Tri Square	Over sanding can ruin a square edge and you may have to start again.	Check edges are smooth by touch. Use a tri square to check for square edges.	Supervised when using machine. Wear dust mask. Wear safety goggles.
Cutting Speaker Holes	45mins	MDF model	Hole Saw Bench vice (secure work).	Marking out inaccurately can lead to speakers not fitting. Must hold hole saw upright so you don't create a lean in the hole.	Re-check measurements before cutting, once cut cannot be undone.	Use with supervision. Wear goggles. Wear dust mask. Secure work so it does not slip.
Apply sanding sealer x3 coats	5mins apply 24hrs to dry	Sanding sealer Sandpaper	Sanding sealer Sand paper Paint brush	Sanding sealer isn't very viscous so runs easily so you may get drips in the work surface.	Don't put too much on the brush.	Use in a well ventilated room.
Apply grey primer	10mins apply 24hrs to dry	MDF model Grey aerosol primer	Spray Booth Scrap piece of MDF Dust mask	Shake can well before use and check the expiry. If it is old the can may be clogged and lots might come out at once. Place model on scrap MDF so you can cover all corners.	When dry see what imperfections have appeared. If there are lots, sand lightly with sand paper and reapply primer.	Use spray booth. Wear dust mask. Use in well ventilated area.
Apply white spray paint	10mins apply 24hrs to dry	White aerosol paint	Spray Booth Scrap piece of MDF Dust mask	As above.	When dry check surface of model, is it smooth, even, are there any cracks? Reapply if necessary.	As above.
Export 2D Design file of acrylic parts to laser cutter and cut.	40mins	Acrylic	2D Design Laser Cutter Bed height gauge	Incorrect settings means you have to re-cut work, time wasting. May not have any of your chosen acrylic left.	Check bed height with gauge. Use test button to check work fits on acrylic. Check settings against manual.	Use with supervision . Make sure extraction is on.
Assembly	1hr	Acrylic Parts MDF Model Tensol Epoxy Resin	Spreader/Brush	Use correct glue for task: Tensol = acrylic to acrylic Epoxy Resin = acrylic to MDF Takes a long time to dry, parts may be knocked or slip while waiting.	Use a tri square/ruler to make sure buttons are glued parallel to edges and look right.	Both glues are toxic, use in a well ventilated area. Make sure it does not come into contact with skin.
Testing and Modifications	30mins	Finished concept model	Survey Ruler Scales	If feedback is negative you may have to start again or dissemble parts to change/modify them.	Use ruler and scales to check measurable specification points. Use survey to get feedback on aesthetics and suitability for brief.	N/A

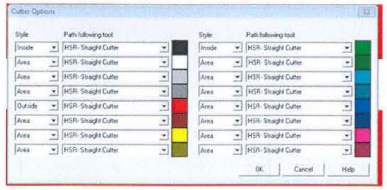
- Details of a sophisticated logical sequence.
- Achievable timeline for manufacture.
- Supports the manufacture.

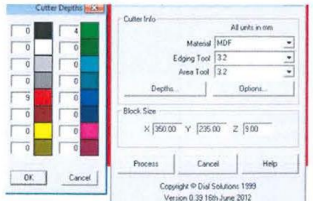


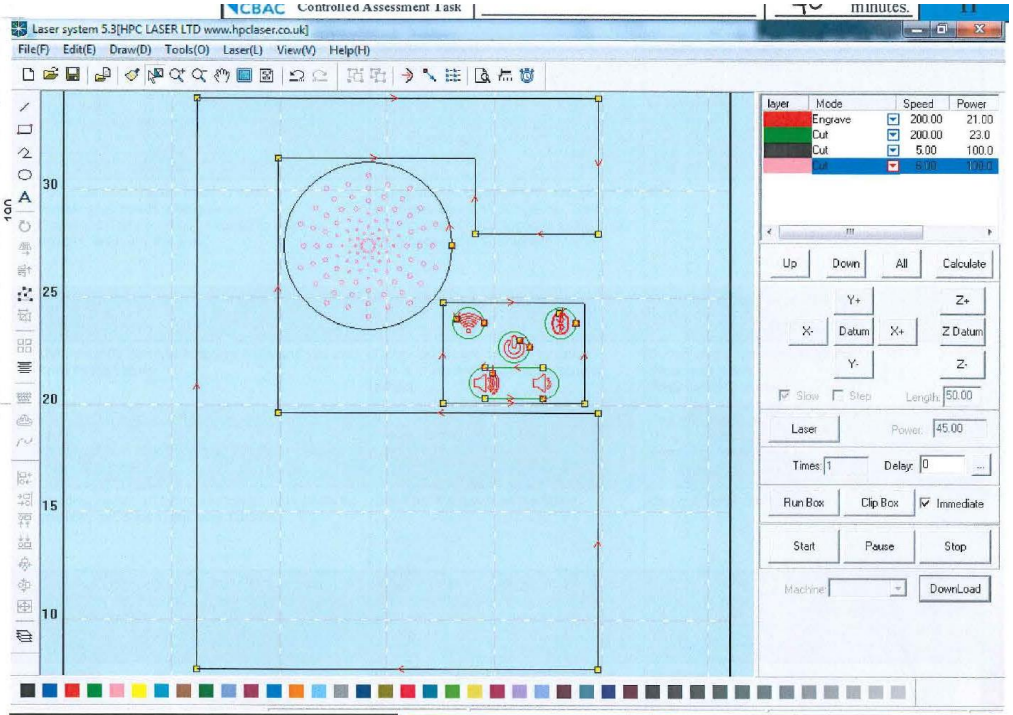
9mm MDF x 6 layers

3mm acrylic x 2 cuts

6mm diameter dowel x 4 @ 100mm length







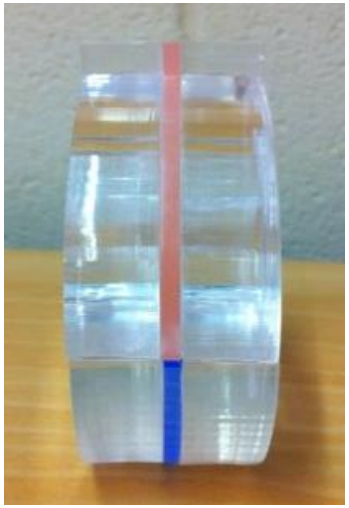
To cut 3mm Acrylic	
Speed	**Power**
6	100

To engrave 3mm Acrylic	
Speed	**Power**
100	21

Materials needed:
MDF
Acrylic
Glue
Sanding sealer
Spray paint
Grey Primer
6mm Dowel

Equipment needed:	
Pencil	Ruler
Paper	Paint brush
Tri square	Spray booth
Coping saw	Mask
Tenon saw	Sanding board
Sander	Sand paper
Hammer	G Cramp
Pillar Drill	2D Design
Hole saw	Boxford
	Laser cutter

Here the learner indicates clearly sizes and machine setting for the making and cutting of the parts of the final product.



Final Prototype

- High quality fully functioning prototype.
- Highly appropriate making skills.
- Excellent understanding shown.
- Specialist processes and materials used skilfully.
- High levels of accuracy achieved.
- A precise outcome.

Band 4 Assessment Criteria – Making a prototype

- Clearly communicated comprehensive and relevant details of a logical sequence and achievable timeline for the stages of production and testing of their final prototype.
- Selected and worked with appropriate materials and components to successfully complete the manufacture of their prototype to a defined schedule.
- Used a range of appropriate making skills and processes to produce a high quality functioning prototype that the requirements of the design specification and is fit for purpose.
- An excellent understanding of the working properties and performance characteristics of the specified materials and, where appropriate, demonstrated consideration of surface treatments/finishes.
- Selected and safely used 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 fully meet the user's requirements.

This learner is clearly demonstrating skills within the 24 – 30 mark descriptor.

Assessment Criteria		Marks	Assessment objective	Guidance
(a)	Identifying design possibilities.	10	AO1	• *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	AO2	
(d)	Making a prototype.	30		
(e)	***Evaluating a prototype's fitness for purpose.***	20	AO3	
	Total	100		

Evaluation

I have made a lamp , that has orange and pink flower petals and that has a wooden base .The specification point reflects to different colours such as the orange and pink because they stand out the asthetics is very important because if it looks nice it will be bought and people will spend money on it. The asthetics could be evaluated visually by when peoples opinions meet the best group.

The purpose of my product is to reflect the chosen era of my design and its designed to illuminate a room and set a mood while being free standing. The main thing is the function so how it works that is very important in my opinion because without a lamp working there's not really a point in having a lamp .The light reflects to the 1960s because that's the time period of my design. Its going to be used because it's a lamp its something that would help you see in the dark. This could be evaluated by seeing if the light actually works. The product is aimed at teenagers 14-16 years old girls living in a house a girly style that makes makes a good teenager., this could be evaluated by checking if it meets the target audience who it is aimed at. This design is used by a a usb and can be placed in a room such as a living room or bedroom for a teenager in the house. This could be evaluated by making sure everything is in its right position so when its needed its easily found and could be used.

The main measurements are the length , width and height of my product is 36-40cm and the length is 10cm and the width is 10-15, the size is very important because you need to know if it would fit where it would be placed so wont be to big or small. This could be evaluated by checking if it's the size you wanted or thought would come out to. The main parts are my flower petals and my base, my main materials are wood and plastic I used acrylic for my petals and I used pine for my base. The product is joined together by glue.
The safety features are no sharp edges no loose parts safety is very important because in case you get get cute and have deep bleeding and other injuries to so should keep away from sharp edges health is first. . Safety could be evaluated by making sure no sharp edges and its all nice and smooth nothing dangerous. I have checked the quality control by making a visual test and a touch text to see if its good. The finished product would cost would be around £10..The cost is important because your making the design and you need to get a reasonable amount back. This could be evaluated by seeing if the materials were good quality so from that the price would be selected.

My product wouldn't effect the environment ,the wood is from a sustainable source, its very important that you would use friendly wood because it comes under safety , also the right amount of energy should be used. This could be evaluated by seeing if it's a sustainable source. Possible conflicts energy skills products costs of the materials vs. size of the design complication or difficult design vs. skills and ability choice of material vs. what is available and what costs. The conflicts is important because I have chose a deign which could be made to a great standard ,with my marked and equipment that could be made in school this could be by the slandered and quality of the lamp.

My over all design meets my design brief but I have added a few changes.
,my lamp works its free standing and it lights. The shape and the size meet my initial suggestions because its all as planed. I think my final product matches the design on mage 10 and 11 I did not make any changes because changes didn't need to be made to my design.Im happy with the materials I chose to make my design out of I chose pine for my base and acrylic for my petals. To make my product I would pain my base in a darker colour so it stands out and is eye-catching instead of the natural look. And I would also add another layer of petals underneath the two but a bigger version in a darker colour so it gives a lift to my design. The colour scheme is how I accspected it to be I would improve it to make it better by using black and white petals. This would definitely alter the cost of my design because it would look more original and unique .My solution is safe to use the reason being is because I have no loose bits and I don't have any sharp edges there nice and smooth. The techniques I used to make my solution adequate i would n't use different range of manufacturing techniques. My design looks very nice unique and modern and lightens the atmosphere in the room because of the light colours used. My target audience group have came up with different suggestions in how to improve my design how it could look more original by changing the colours of the flower petals and varnishing my base and making sure there was no scratches on the wood.

Band 4 Assessment Criteria – Evaluating a prototype's fitness for purpose.

- Undertaken a critical, objective analysis, evaluation and testing of their ideas and decisions whilst applying iterative design processes.
- Undertaken a critical and objective evaluation and testing of their final prototype, taking into account the views of potential users.
- Responded to feedback and clearly identified the potential for further development of their prototype, with detailed suggestions for how modifications could be made.

The learner does not quite meet all of the descriptors here, so cannot be awarded the Band 4 level 16 - 20 marks. The learner deserves a Band 3 mark, which fits between 11-15 marks. There is some reference to users and testing, but due to the lack of evidence, and depth of analysis, 13 marks would be a fair reflection.

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

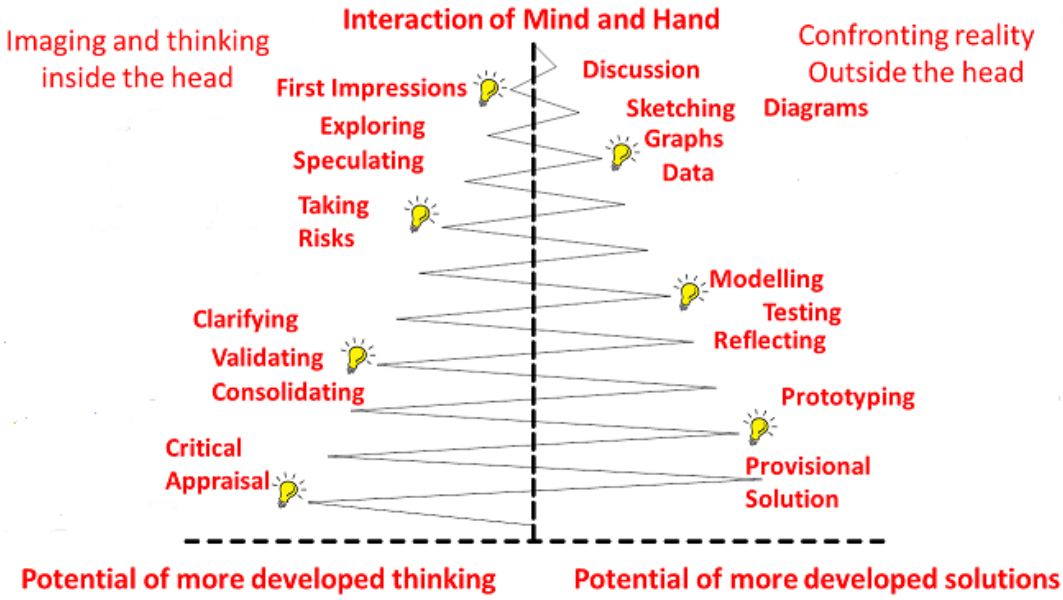
Informal A4/A3 sketchbook	Formal presentation A3 portfolio	Final prototype (fully functioning high quality product)

Exemplar pages can be found on the WJEC website:

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

Design iteration

Definition: A design method based on the process of prototyping, testing, analysing, and refining a product or process. It is not a 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

You are allowed to guide/support the learner through the iterative process. The subject teacher should check that the learner selects a problem that is appropriately challenging and provides the opportunity to address all the assessment criteria. For further details on teacher guidance please refer to pages 36-37 of the specification.

Further support and resources

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

http://resources.wjec.co.uk/Pages/ResourceByArgs.aspx?subId=8&lvlId=0

Past papers, marking schemes and CPD resources can be found on the secure website.

https://www.wjecservices.co.uk/login.asp

Permission for access to the secure website must be sought from your examinations officer.

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 learner.

Command words	Marks	Comments
Give State Name	1 mark	These command words will feature in the early parts of questions. These are designed to ease the learner into the question. They need a simple statement or a short phrase. The do not need elaboration or explanation in the answer.
Describe Outline	2 marks	These command words will be commonly used on the paper and will feature in many questions. These questions ask the learner 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.
Explain Justify	2 or more marks	These command words will be commonly used on the paper and will feature in many questions. These questions are asking the learner 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 learner will need to make a valid point and justify it.
Evaluate Analyse	2 or more marks	These command words will feature towards the end of some questions. • *Evaluate could involve assessing or appraising a situation or product or material giving reasons to support their answers.* • *Analyse means examining and dissecting a situation or product giving thoughtful appropriate reasons to support the answer. It could include finding logical chains of reasoning.* These questions are designed to test, stretch and challenge the more able learner. The question requires the learner to make a well-balanced argument involving both advantages and disadvantages. Extended writing will be required

Banded descriptors

This form of assessment will be associated with the questions that specifically require an extended answer. It will also be used 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**

The following are general examples of questions with information about how they would be marked.

Examples

Question 1

Give two reasons why paper is sometimes laminated. [2]

What is required?

The question is a straightforward "give" question so short statements or phrases are needed and they do not need justification.

Weak answer

Reason 1: Makes the paper stronger. (1)
Reason 2: (0)

Here the learner gives one relevant answer. However they have not attempted to state a second reason. It is vital that all parts of questions are answered.

Good answer

Reason 1: Makes the paper stronger. (1)
Reason 2: Protects the paper. (1)

Here the learner gives two relevant answers.

Question 2

Eight card handles for a carrier bag can be CAM cut from one A3 sheet of card.
Describe one advantage to the manufacturer of doing this. [2]

What is required?

The question asks the learner to describe an advantage that the manufacturer would gain from cutting more than one handle from each sheet of card. Short statements or phrases will not be adequate. A clear description with justification using a sentence or sentences is needed.

Weak answer

It is cheaper because the handles can made in batches which reduces costs. (1)
Here the learner gives a relevant answer but the learner does not give any detail of the advantage.

Good answer

It reduces the cost of making the handles, as there will be less waste material than cutting one handle from each piece of card. (2)

Here the learner gives a full and detailed answer in a well-constructed sentence.

Question 3

Explain why it is necessary to score printed card that is 500 microns thick before folding it to make a package [3]

What is required?

- *The question asks the learner to explain the reasons for having to score card before folding.*
- *Short statement will not be adequate.*
- *A clear explanation using a sentence or sentences is needed clearly stating a reason and then elaborating the answer with appropriate reasons.*

Weak answer

500 micron printed card will not fold easily so scoring the card makes the card able to be folded. (1)

Here the learner gives a relevant answer but does not give any detail to support their assertion.

Satisfactory answer

It makes the card easy to fold because it makes a dent in the card where it is to be folded.(2)

Here the learner gives a relevant answer and does give some detail to support their assertion. The detailed reason is rather superficial, as it does not explain why the card is easier to fold.

Good answer

It makes the card easy to fold because it makes a dent in the card where it is to be folded. This dent stretches some of the fibres and squashes others into a U shape so that they are ready to fold. (3)

Here the learner gives a full and detailed answer in well-constructed sentences. They show a detailed understanding of the reasons that allow the process to work.

Suggested frameworks for delivery

This GCSE in Design and Technology is designed to be taken by 16 year-old learners following a two-year programme of study comprised of 120 guided learning hours (GLH). This is reflected in the breadth, depth and challenge of the content that learners will be assessed against.

<table>
<tr><th colspan="10">WJEC GCSE D&T New Specification – Year 10 Possible Course layout</th></tr>
<tr><td colspan="2">Sept Oct</td><td>Nov</td><td colspan="2">Dec Jan</td><td>Feb</td><td colspan="2">Mar Apr</td><td>May</td><td>June Jul</td></tr>
<tr><td colspan="2">New and Emerging Technology
Design Practice 1
Alessi CAD CAM KeyFob</td><td>Work of Others
Presentation
Research, Product Analysis Evaluation</td><td colspan="2">Energy – Eco design
Design Practice 2
Solar powered novelty</td><td>Modern and SMART Materials
Product Study</td><td colspan="3">In-depth Knowledge and understanding
Engineering Design
Fashion & Textiles
Product Design</td><td rowspan="5">NEA – 3 Contexts Released by WJEC 1st June
Context analysis – multiple starting points
NEA tasks begins – 35 hours
Sketchbook analysis
Formal Portfolio</td></tr>
<tr><td colspan="4">Core knowledge & Understanding</td><td>Focussed Study</td><td colspan="3">In depth Knowledge and understanding from Specification</td></tr>
<tr><td colspan="2">• D&T and our world
• CAD CAM
• Emerging technology
• Electronics
• Materials / Polymers
• 3D printing PLA</td><td>• Study on designers
• Professionals
• Companies
• In Wales
• Their style
• Products / USP
• Their impact</td><td colspan="2">• Sustainability
• Energy – solar -wind
• Greener design
• Ecological footprint
• Generating clean energy
• Life cycle analysis
• Cradle to cradle</td><td>• Thermo's
• Photo's
• SMA and nitinol
• Polymorph
• QTC pills
• Fibres
• Others</td><td colspan="3">• Further study in specialist area
• More depth in chosen topic
• Narrower / deeper coverage
• Additional topics
• Focussed tasks
• Disassembly / evaluation
• Specific coverage of topics
• Pushing iteration forwards</td></tr>
<tr><td colspan="4">Core Designing & Making Principles</td><td>Product Analysis</td><td colspan="3">In depth Designing & Making</td></tr>
<tr><td colspan="2">• D&T Practice
• User needs
• Brief / Specification
• Iterative design development
• Work of others
• Prototyping
• Decision making</td><td>• Users
• Sketching
• Ideas / concepts
• Prototypes
• Evaluating
• User trials</td><td colspan="2">• Material areas may vary
• Group activities
• Different mechanical systems / outputs
• Iterative designing</td><td>The study of a wide range of products that use SMART, modern and technical materials</td><td colspan="3">• Mini tasks
• Specialist processes
• Specific practical skills
• Further study
• Examination practise
• Challenge / advanced content
• Preparation for NEA in Yr11</td></tr>
</table>

Eduqas GCSE D&T New Specification – Year 11 Possible Course layout									
Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Assessments
NEA – Context **Released on June 1st** **Centres / candidates can start analysing contexts** **Informal Sketchbook work** **Formal Folio work**				**NEA – Prototyping** **Refinement of Proposal** **Informal Sketchbook work** **Formal Folio work**		**NEA – Prototyping** **Completion of Final Prototype Manufacture** **Final Prototype**		**NEA – Testing, Final Evaluation And modifications** **Final Prototype** **Formal Folio work**	**Deadline for NEA Marks – secure website – 2nd week May** **GCSE Moderation - 3rd / 4th week May** **GCSE D&T Examination Paper – end May / early June**
Iterative Designing				**Iterative Designing**		**Manufacturing Final Prototype**		**Evaluating Final Prototype**	
• Research into the context • Understanding User requirements • Considering range of possible design briefs • Sketching ideas • Disassembly / analysis of other products • Modelling & testing • Inspiration sources • Further research • **ITERATIVE CYCLE** (NO STARTING OR ENDING POINT)				• Refining ideas • Construction issues • Functional requirements • Materials and Processes • Joining / combining • Finishing techniques • Innovations and creativity • USP		• Production • Quality control • High quality skills • Safe use of equipment and machinery • Accuracy in implementing final prototype • Final assembly • High quality finish		• Testing of Final Prototype in context • User Trials and analysis • Specification • Identification of modifications • Expert advice / opinions • Evaluation techniques	
Outcomes				**Outcomes**		**Outcomes**		**Outcomes**	
• Full understanding / appreciation • Range of possible briefs evident • Clear Final Brief and Specification • Varied research / investigation results • Early models, test pieces, experiment • Materials / manufacturing methods Risk Reward • Aesthetics / form / appearance				• Scale / models • CAD simulations • Card / foam / 3D • Evidence of testing • Evolving iterations • Jigs, formers, patterns, templates, moulds.		• Analysis of development • Iterations • Final Prototype construction • Final assembly • Finishing techniques applied		• Final evaluation in Formal Folio • Opinions of Users through testing Final Prototype • Prototype V Spec • Identify / make modifications	

Frequently asked questions

Question	Answer
Does this qualification count in performance tables?	Yes. This qualification counts within performance tables in Wales.
What is the split in the qualification for the exam and coursework units?	50% for each unit (Exam and Non-exam assessment).
How will the units be assessed?	Exam unit – Externally examined (2 hours, 100 marks). Non-exam assessment (NEA) – Internally marked and externally moderated (approx. 35 hours, 100 marks).
Will there be any resources available?	We are currently working on a website which will include useful resources, such as information on materials and processes, plus quizzes for learners. This will be ready for the start 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.
What are the topic areas within the core knowledge?	• design and technology and our world • smart materials • electronic systems and programmable components • mechanical components and devices • materials
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 is the NEA 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 for learners to work on?	There is no prescribed workbook. Learners are to use an formal portfolio and a 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, refinement 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 the learner has used in the development of the design and make project.
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. Drawing 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?	There will be three contextual challenges made available from 1st June in the year prior to the award. They will be designed so that learners can go down the route of their area of interest. Centres are encouraged to let the learner decide upon their own design brief.

How will the design and make unit be assessed?	Internally marked and externally moderated. A WJEC moderator 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 that A4 or A3 paper size should be used. Our recommendation is no more than 20 x A3 (approximately). Please note this is a recommendation, what we don't want to see is that centres are making learners do more and more sheets because volume creates more marks. This will not be the case it is the quality of the work that is submitted that will decide upon the marks.
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.
Can work be taken home?	Yes. The majority of the work should be done within the school to ensure that the assessor is able to authenticate the work as being the learner's own We suggest that you only allow the learners to take home what they are working on and leave the rest of the work in a secure place within the school.
Are writing frames allowed?	No. As soon as you add in framed boxes onto pages this 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 the school or college, each learner must produce their final prototype or prototypes under *'immediate guidance or supervision'.* This means the prototype(s) have to be produced either: (i) with the simultaneous physical presence of the learner and the supervisor, or (ii) remotely by means of simultaneous electronic communication. In most cases supervision will be of the form described in (i), but in some circumstances, for example, if the learner is carrying out a specialist process away from the centre, (ii) may be more appropriate.
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.