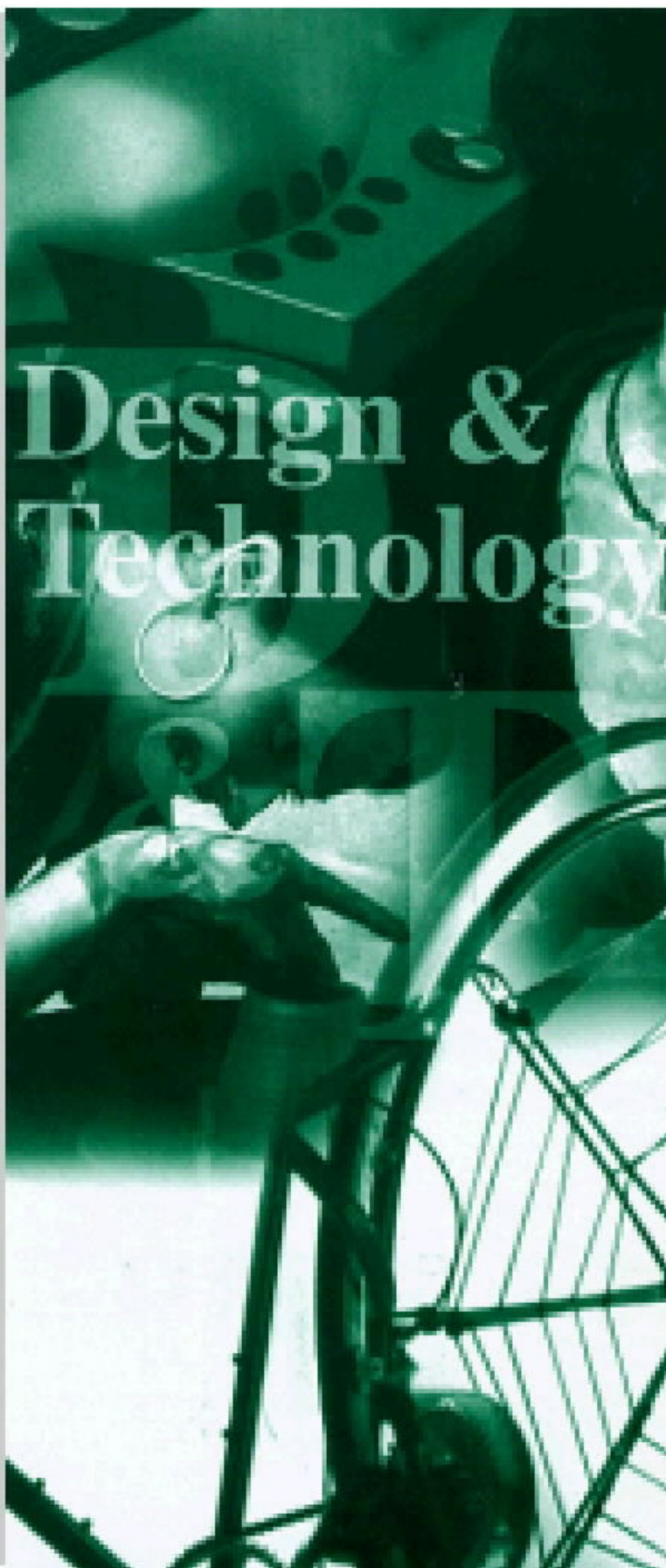


# Student Handbook D&T



## PROJECT CHECK LIST

<b>SECTION</b>	<b>DONE</b>
<b>Brief</b>	
<b>Analysis</b>	
<b>Research</b>	
<b>Specification</b>	
<b>Ideas</b>	
<b>Development</b>	
<b>Each part is designed</b>	
<b>Construction is detailed</b>	
<b>Orthographic drawings with measurements</b>	
<b>CAD drawings</b>	
<b>Isometric drawings</b>	
<b>Plan for making</b>	
<b>Costing</b>	
<b>Test grid</b>	
<b>Testing</b>	
<b>Evaluation</b>	

## Introduction

The aim of this hand book is to guide you through the process of designing and making in a way that will ensure you meet all of the requirements of the exam board.

This is a step by step approach and none of the steps should be missed out.

Success is a product of the effort you put in. The majority of students fail because they:

- Miss out sections of the project
- Do not meet the required deadlines
- Produce poor quality, rushed or incomplete work.
- Waste time in class when they should be working
- Fail to complete work at home for Homework or during holidays.

Your project counts for 60% of the marks and the exam for 40%

### **How to use this book.**

This book can only help you organise your coursework if you:

- a) understand what you are trying to achieve.
- b) follow the guide in this book.

### **The deadlines.**

The exam board say that the GCSE coursework should take 40 hours of work. This covers the design work in the folder and making your product(s). The making should take more time than the designing. **Approximately 17 hours folder and 23 hours making.**

40 hours is approximately 43 lessons at 55 mins per lesson., at 3 lessons per week this is some 14.5 weeks, or roughly a term.

**NOTE:** this is the lesson time allocated and does not include any extra time you use at home for homework or during the holidays.

You will only achieve this if you are organised and work to the deadlines.

On the other hand you will most certainly not achieve this if you do not do any work outside the classroom.

A suitable allocation of the time is detailed on the next page. It is recommended that you make a more detailed version showing the individual tasks required to complete each section.

The rest of this hand book will explain what should be in each section, offer hints and tips on how to meet the highest requirements of the exam board to achieve grades A and B and show some examples of how you might present your work.

Activity	Time in hours	Completed by week / date
Identify a suitable project	.5	1
1 Brief	.5	1
Analysis of the Brief	.5	1
2 Research	4.5	3
Research plan	.5	
Collect research	1.5	
Organise research	1	
Analyse research	1	
3 Specification	.5	
4 Ideas	2	4
5 Development	4	6
6 Making	24	13
7 Testing	1	14
8 Evaluation	2	15
<b>Total time</b>	43.5	

Project management is all about:

- a) Knowing what you have to do
- b) When it need to be done
- c) When it is finished

In order to do this the table below will be ticked off by you as you complete the various sections.

**NOTE:** Completed means it has been done to GCSE standards.

Activity	Done	Date done
Identify a suitable project		
1 Brief		
Analysis of the Brief		
2 Research		
Research plan		
Collect research		
Organise research		
Analyse research		
3 Specification		
4 Ideas		
5 Development		
6 Making		
7 Testing		
8 Evaluation		

## **How to get good grades**

### **Grade A**

When designing and making products, and acquiring and applying knowledge, skills and understanding, candidates seek out and use information to help their detailed design thinking, and recognise the needs of a variety of client groups. They are discriminating in their selection and use of information sources to support their work and they use a wide range of strategies to develop appropriate ideas, responding to information they have identified.

Candidates investigate form, function and production processes and communicate ideas using a variety of appropriate media. They recognise the different needs of a range of users when developing fully realistic designs. When planning, they make sound decisions on materials and techniques based on their understanding of the physical properties and working characteristics of materials. They work from formal plans that make the best use of time and resources; work with a range of tools, equipment, materials and components to a high degree of precision and make products that are reliable and robust and that fully meet the quality requirements given in the design proposal.

Candidates identify conflicting demands on their design, explain how their ideas address these demands and use this analysis to produce proposals. They identify a broad range of criteria for evaluating and testing their products, clearly relating their findings to the purpose for which the products were designed and the appropriate use of resources, and fully evaluate their use of information sources

### **Grade C**

When designing and making products, and acquiring and applying knowledge, skills and understanding, candidates use a wide range of appropriate sources of information and strategies to develop ideas, responding to information they have identified. They investigate form, function and production processes and communicate ideas, using appropriate media.

Candidates recognise the needs of users and develop realistic designs. They produce plans that make use of time and resources to carry out the main stages of making products. They work with a range of tools, materials, equipment, components and processes, taking account of their characteristics, and organise their work so that they can carry out processes accurately and consistently, and use tools, equipment, materials and components with precision. Candidates adapt their methods of manufacture to changing circumstances, providing a sound explanation for any change from the initial specification. They select appropriate techniques to test and evaluate how their products would perform when used and modify their products in the light of ongoing evaluation to improve their performance. They evaluate their use of information sources.

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**Factors leading to higher grades include**

- Projects that stretch the candidate in terms of overall difficulty (concept, skills, techniques)
- The design development of the product is clearly shown and reasons are given for decisions made
- Clear, dimensioned views, using CAD, are offered to aid manufacture
- Less time is spent on the design than the making
- Quality of manufacture and finish is appropriate and of high quality
- Awareness of CAM is shown in parts of the project
- CAM is used to aid manufacture, if appropriate
- Consideration is given to commercial market needs and a system is suggested to produce the product in numbers.
- Projects are reviewed and tested throughout the making process (project diary)

**Assessment Criteria AQA product design exam**

<b>Grade A</b>	
<b>Designing</b>	<b>Making</b>
1. Used a <b>wide variety</b> of appropriate sources to gather relevant research information; 2. <b>Analyzed</b> the task and the <b>research material</b> logically, thoroughly and effectively; 3. Produced a <b>detailed specification</b> which focuses closely on the analysis; 4. Produced a <b>wide range</b> of distinct proposals which satisfy the specification; 5. Used one or more of their proposals and relevant knowledge of techniques, manufacturing and working characteristics to develop a <b>detailed</b> and coherent <b>design solution</b> ; 6. Produced a <b>correct sequence</b> of activities which shows where, why and how practical production decisions were made; 7. Tested, <b>objectively evaluated</b> and effectively <b>modified</b> their work throughout the process as appropriate; 8. Selected and skillfully used a <b>wide range</b> of communication, graphical and ICT skills which have helped to clarify their thinking and are sufficient to convey ideas to themselves and others effectively and precisely; 9. Provided <b>evidence</b> that they have considered and taken account of relevant issues, industrial practices and systems and control.	1. <b>Recorded</b> and <b>justified</b> the need for any changes or adaptations; 2. Used <b>appropriate</b> materials, components, equipment and processes (including CAM) consistently correctly, skillfully and safely; 3. Made a <b>complete product</b> of <b>high quality</b> ; 4. Demonstrated an ability to satisfy accurately and completely <b>all the demands</b> of the design solution; 5. Thoroughly considered <b>QA &amp; QC and applied</b> them consistently and successfully.

<p><b>Grade B</b></p>	
<ol style="list-style-type: none"> <li>1. Produced a well ordered and relevant range of appropriate research information;</li> <li>2. Thoroughly analyzed the task and research material;</li> <li>3. Produced a detailed specification closely reflecting the analysis;</li> <li>4. Produced a wide range of proposals which satisfy the specification;</li> <li>5. Used their proposals and relevant knowledge of techniques, manufacturing and working characteristics of materials to develop a detailed design solution;</li> <li>6. Planned the correct sequence of making activities;</li> <li>7. Tested, evaluated and modified their work throughout the process as appropriate;</li> <li>9. Used an appropriate range of communication, graphical and ICT skills sufficient to convey ideas to themselves and others effectively;</li> <li>9. Provided evidence of having considered relevant industrial practices and systems and control.</li> </ol>	<ol style="list-style-type: none"> <li>1. Recorded and justified the need for any changes or adaptations;</li> <li>2. Used appropriate materials, components, tools, equipment and processes (including CAM) skilfully, correctly and safely;</li> <li>3. Made a complete, effective and skilfully-produced outcome;</li> <li>4. Demonstrated a level of accuracy and finish in the product which satisfies the demands of the design solution;</li> <li>5. Provided evidence of QA &amp; QC throughout manufacture.</li> </ol>
<p><b>Grade C</b></p>	
<ol style="list-style-type: none"> <li>1. Used a variety of appropriate sources to gather and order relevant research information;</li> <li>2. Analyzed the task and the research material;</li> <li>3. Produced a specification which reflects the analysis;</li> <li>4. Produced a range of proposals which satisfy the specification;</li> <li>5. Used their proposals and relevant knowledge to develop a detailed design solution which satisfies the specification;</li> <li>6. Planned a largely correct, and workable, sequence of main making activities;</li> <li>7. Tested, evaluated and modified their work throughout the process as appropriate;</li> <li>8. Used a range of communication, graphical and ICT skills sufficient to convey ideas to themselves and others;</li> <li>9. Provided evidence of having considered relevant issues, industrial practices and systems and control.</li> </ol>	<ol style="list-style-type: none"> <li>1. Recognised the need for and justified any changes or adaptations;</li> <li>2. Used appropriate materials, components, tools, equipment and processes (including CAM) correctly and safely;</li> <li>3. Produced a complete, effective and well-assembled outcome;</li> <li>4. Demonstrated a level of accuracy and finish in the product which satisfies most of the demands of the design solution;</li> <li>5. Clearly used QA and QC to control quality in most activities.</li> </ol>

## **Finding a suitable project.**

You should show how you have looked at various opportunities. A web diagram analysing the initial brief is a good way to do this.

## **Brief.**

**The brief is a statement of the problem you are trying to solve.**

The General brief for the Product Design could be:

“Design and make a product that uses light as a function of its design. Your product will be a working prototype of a design that is suitable for large scale production”

Limitations:

Your product will:

- Be safe to use
- Use a low voltage illumination system (12 volts or less)
- Be a working prototype
- Cost under £5 to manufacture



## Analysing the brief.

This is best done with a web diagram:

- a) You need to start to think about what the brief is asking
- b) What sort of project might solve it.
- c) Who the end user might be.
- d) What materials might be used
- e) What mechanisms might be used
- f) What style is involved
- g) What construction techniques you might use
- h) What functions are required
- i) Where the product will be used
- j) Who might use the product
- k) What sort of finish is required

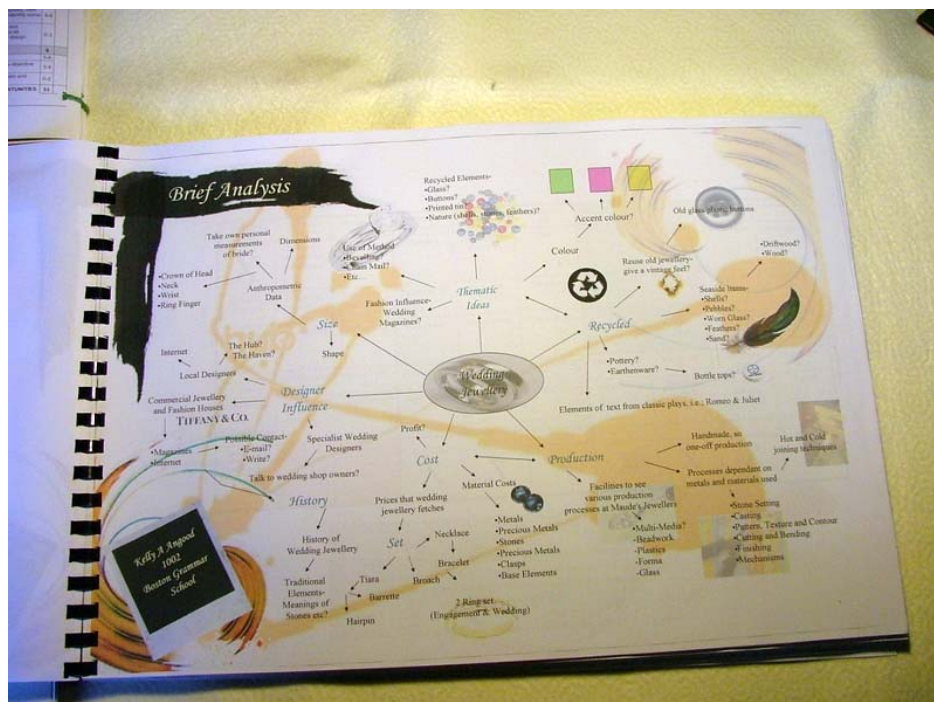
All of these things should appear in your analysis web diagram.

These thoughts will help you decide what you need to research in order to make your design.

Once you have got to this stage you will have decided in general what you want to make. You should now write a brief for your product explaining what the problem it, what the product must do and who the end user will be.

Example:

To design a piece of wedding jewellery suitable for a modern bride. This will be themed to a bridal market and will be aimed at the 18 to 30 year old client. My product will also meet the requirements of the general Brief.



## Research.

Once the problem has been analysed you should start your research **based on the information in your analysis**. Your Research is **connected and guided** by your analysis work so far – Remember what your product is, where it will be used and who will use it.

This is often the hardest part as finding information that is useful can be quite difficult and it is easy to collect a lot of information much of which is no use to your project.

### **DO NOT COLLECT INFORMATION AT RANDOM !**

Only research those things you will use.

The most important research is looking at existing products and analysing how they are made, materials and construction techniques. Detailed materials research can be done later when you have sorted out some of your idea and have a reasonable feeling for what you may be using.

## Research Plan.

You should make a table showing the areas you intend to research, where to get the information and when it is needed, also add a tick box to tick off when it is done.

All research should be limited to what is specifically connected with your project.

What to research	Where to get it	When it is needed	Done
	Internet Books Magazines CD ROMs News papers Surveys Questionnaires Interviews		

Collect information on:

- a) Existing products in the area you are considering – Most important, this is where you get ideas from.
- b) Materials you can see have been use to make these products or you are fairly sure you will be using. Typically Plastics, hard or soft wood, Brass, Aluminium Mild steel.
- c) Style examples if appropriate. Modern, Traditional, Futuristic
- d) Construction techniques.

**All of the pictures you have collected should be analysed** and notes made about what they show and what is going to apply to your project. Note the materials used, the general shape and features of the product and where possible suggest manufacturing methods that may have been used to make it:

Typical methods include: Injection moulding plastic parts, Blow moulding hollow objects, CAD/CAM operations, Hand assembly of small complex parts, Casting.

The exam board suggest **NOT** doing surveys as the value is in the evaluation/analysis and this is generally done very badly – It is better to spend time improving existing products research and the analysis of those products. All surveys & questionnaires if used should be analysed using ICT (spreadsheet and charts). Do not put the response sheets in your folder only the results.

**At the end of the research summarise what you have found out. This information will be used to write your specification.**


### Doing your research.

If at the end of any time you spend on research you have nothing put into your folder you have wasted that time. Only the research that shows evidence will gain any marks. Show your research in different ways. Drawings, Pictures including photographs you have taken, Tables, Lists.

You should collect:

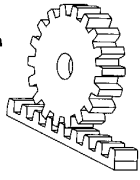
- Pictures showing existing products
- Pictures showing the environment your product will be used in
- Pictures of materials
- Examples of construction techniques, pictures or drawings
- Information about materials – put these in a table
- Information about styles – pictures
- Information about suitable finishes – in a table

### Presenting your research.

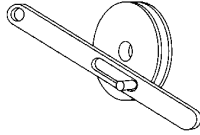
 **Research** Here are some of the mechanisms and materials I looked closely at.

**Mechanisms**

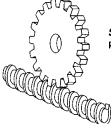
**Rack and pinion**  
Rotating to linear



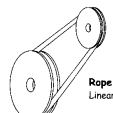
**Peg and slot**  
Rotating to oscillating



**Screw thread**  
Rotating to linear



**Rope and pulley**  
Linear to rotating



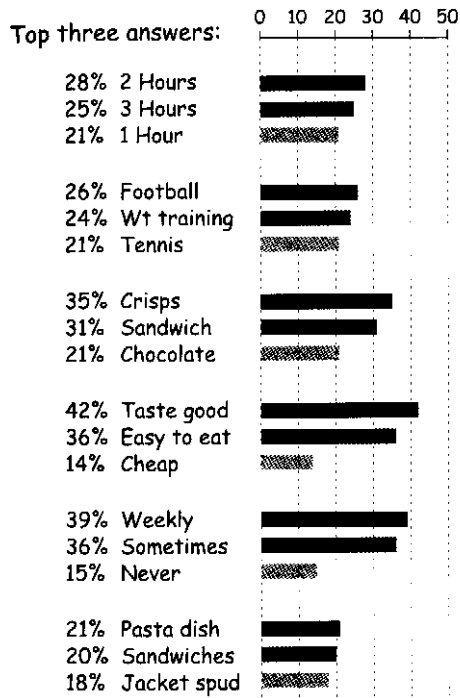
You might use annotated sketches

Materials	Useful properties	Disadvantages
<b>Mild steel</b> Alloy of iron and carbon	Easily worked and machined. It can be joined by brazing, welding, and the use of screw threads and rivets. It is inexpensive and available in many forms: thin rod, tube, strip and flat sheet.	Easily rusts and will not withstand condensation problems, unless it is either chromium-plated, plastic-coated or protected in some other way.
<b>Acrylic</b> Polymethyl Methacrylate	Stain and moisture-resistant. It is easily worked and shaped and can be formed by heat. It is attractive and available in a variety of colours.	Acrylic can be brittle, and holes should not be drilled too close together. The edges need to be carefully polished if it is to look its best - this can be time-consuming.
<b>Brass</b> Alloy of copper and zinc	It machines well and can be used for parts of the project which need precision. Its 'gold'-like appearance can provide a pleasant contrast if used alongside wood or acrylic.	Expensive, easily discolours and tarnishes if not constantly polished or protected with a 'lacquer'.
<b>Aluminium</b>	Soft, lightweight, easy to work, bend and polish.	Very difficult to join by soldering or welding without specialised equipment.



Table of material properties

## Results



Use graphs or charts to analyse numerical data – There are marks for using different techniques.

### You need to research as a minimum:

- Existing products
- Construction techniques
- Joining techniques
- Lights.
- Power supplies
- Materials you will use.

# Research

After reading a number of jewellery making books and manuals I have become very interesting in bezels. So, for this page I shall be looking at two types of bezel with I would like to introduce into my work. I shall be looking at the manufacture of jump rings as I feel this will be a vital component to almost any jewellery I make.

## Bezels

When making a bezel it is important to fit the bezel to the stone. The best material to use to make a bezel is bright fine silver bezel wire, as this is malleable enough to press safely over the stone. Sterling, gold, copper and brass can also be used. The following illustrated steps show how to make a bezel.



[1] Bend a loop of flattened wire around the stone.



[2] Solder the bezel closed, using a small piece of hard solder.



Finished Piece



[3] After testing the fit, solder the bezel to a backing sheet.



[4] In this case wire was added for decoration. Trim away any extra sheet.



[5] Stamps are used to ornament the wire.



[6] Working side-to-side, use a bezel pusher to press the bezel against the stone.



[7] The bezel can be smoothed and polished with a pumice wheel followed by light buffing.



## The Pedestal Prong Setting

This is a versatile, hybrid setting that lends itself to cab and faceted stones, large and small, symmetrical and irregular. It is also one of the only settings to be able to support stones on an uneven number of prongs. Below is a basic step by step guide to making a pedestal prong setting.

## Finished Piece



[1] Position sharpened wire prongs around the pedestal. Press into fire brick for soldering.



[2] Trim off extra length on the prongs and file the underside smooth.



[3] Complete after soldering, in this case adding a decorative ball.



[4] Set the stone with a bezel pusher...



[5] ... or with pliers, as shown.



Jump rings are great all-purpose components, although you can use them as primary components for chain maille and other types of jewelry. Use a 20 to 22 gauge wire. Gauge 20, 21 and 22 are most commonly used.

## Jump Rings



[1] Wrap your wire tightly and evenly around your mandrel. Make sure there are no gaps.



[2] The finished product.



[3] Make the wire perpendicular to the axis of the mandrel (make sure you want oval rings). And slide the coils off the mandrel.



[4] If you want rings a size, wrap a strip of emery paper along the coils to loop the rings together and cut into the coil. You can make wire cutters. Make sure you cut in a straight line. Remember to wear safety goggles.

Note: It is important when opening and closing jump rings to open them sideways and not straight apart as this will weaken their structure.

## Specification.

This is a description of **the functionality** of your produce. This means you are describing what it must do. There are many ways to do this but a bullet point list works best and is easy – You may separate the list into Must do – Might do – Safety – Limitations.

This **MUST** be connected to your research and analysis. You must make this obvious – **For every point in the specification** you must have some reason/evidence in your research to back it up. Sometimes you can see things in your existing products pictures e.g. no sharp edges – No loose wires etc.

This is a statement of what you are going to make and what it will have to do i.e. it's functions. It includes enough information to clearly identify the product you will make but try not to limit your design with too much detail e.g. sizes materials etc. It is if you like a list of requirements that your completed product will meet.

It might contain all **or some** of the following – Use bullet points:

- a) What the product must do
- b) Any safety issues it must meet
- c) Special features for the environment it will be used in
- d) How the product will be tested
- e) How long the product has to last
- f) How the product will be stored or displayed
- g) Details of any packaging
- h) Details of any instructions required
- i) Properties of any materials that will be used
- j) Details of what type of finish is required
- k) Ergonomic requirements
- l) International standards the product must meet – If you quote these you must find out what they are.
- m) Visual requirements the product might have
- n) Specific performance requirements
- o) Cost limits
- p) Specific size limits
- q) Specific weight limitations
- r) Specific material limitations
- s) Maintenance requirements e.g. change battery

**Select those items that can apply to your project.**

## **Ideas.**

In this section you should aim to produce between 7 to 10 different ideas that will all **satisfy the requirements of the specification**. A good way to generate ideas is to look at the specification and draw 2 or 3 ways to satisfy each point in the specification. Sometimes you can include several specification points in each design idea. Make sure you show in your annotation which specification points you are addressing.

**Fill each design page** with ideas or details of the ideas. Use a variety of ways to get your ideas over, Isometric and orthographic drawing, **annotate** all drawings to explain what they mean but do not have more words than drawings on the paper.

Try to produce ideas that are clearly workable. Try to show that they are 3D objects. Try to show how they work and what they do. Always show the thickness and depth of the ideas simple line drawings are probably not enough.

Use your research – it should be clear that you are looking at your research as a source of inspiration – **MAKE THIS CLEAR**.

Look around you all the time and try to find things that can inspire ideas.

The shape of a vacuum cleaner can become a futuristic car body. The design of a toy can be modified to make a kitchen timer. Etc.

Do not throw away marks by editing out ideas that you feel are not as good as others. Keep all of your work and select the best from it later.

All of your ideas should be evaluated in notes as you go along.

Keep your design pages neat – Start at the left and work towards the right so that the examiner can follow what you are doing.

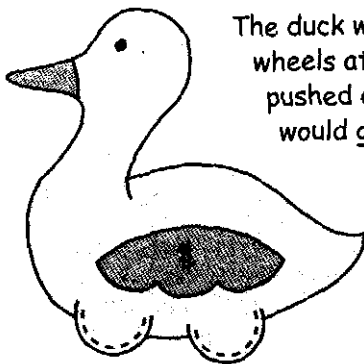
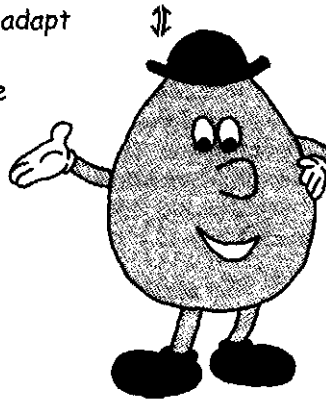
### **Think about:**

- a) Does this design meet the requirements
- b) Explain why you have rejected an idea
- c) Show where you have used material from your research
- d) Say what decisions you have made
- e) Say how you could improve on an idea
- f) Decide if the idea is appealing and say what you could do to improve this.

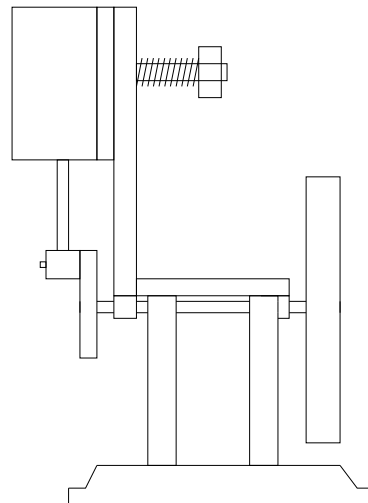
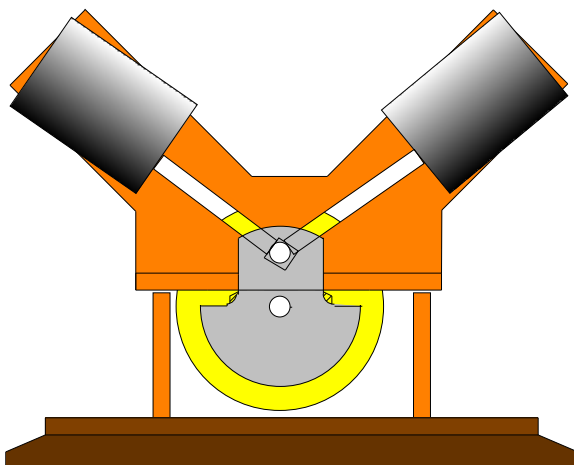
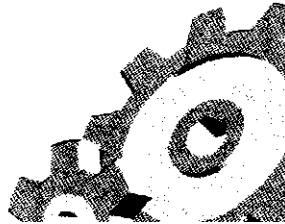
List alongside your designs the materials that might be used, are they available, do you know how to use them.

# Initial Ideas

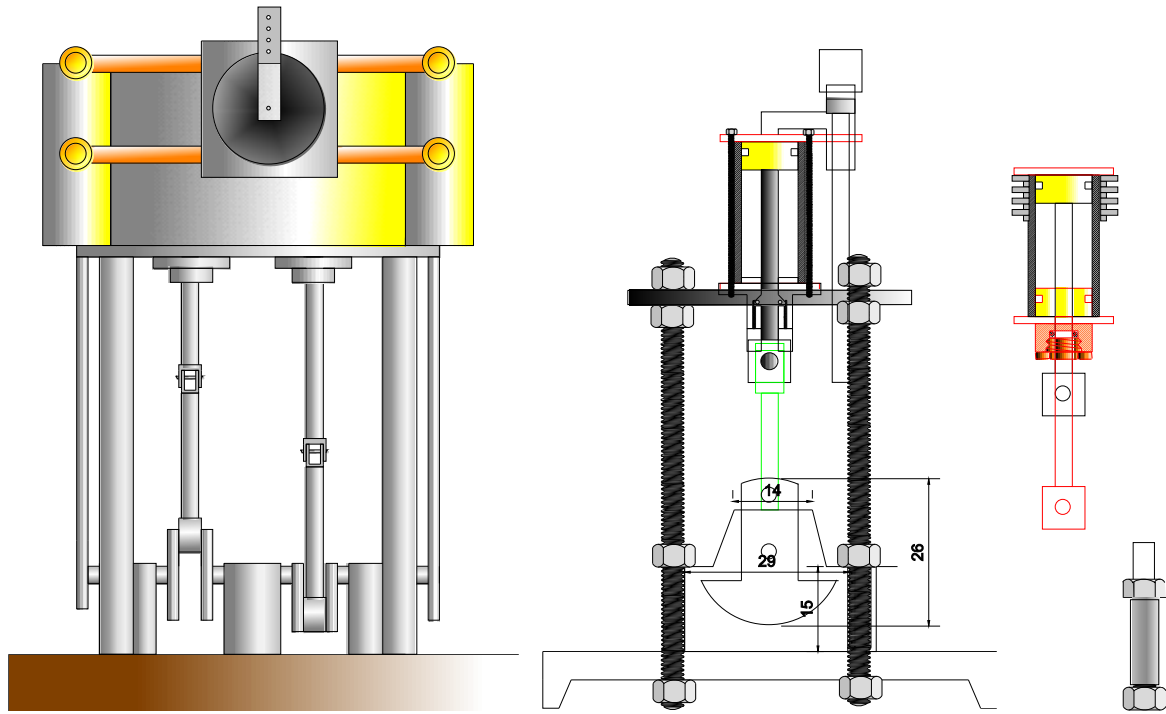
This is a simple figure. I will adapt his feet to be round wooden cylinders, so he can roll or be pushed along the ground. As he rolls, I would like his hat to go up and down.



The duck would have wooden wheels at its base. When pushed along, his wings would go up and down.







Different ideas for steam engine designs.

## Development

### Contains:

Orthographic drawing of EVERY part you will have to make

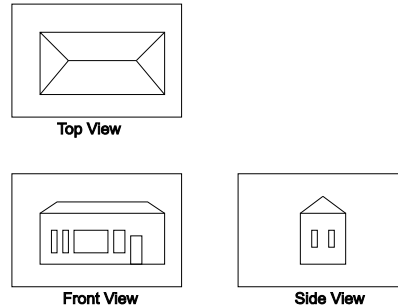
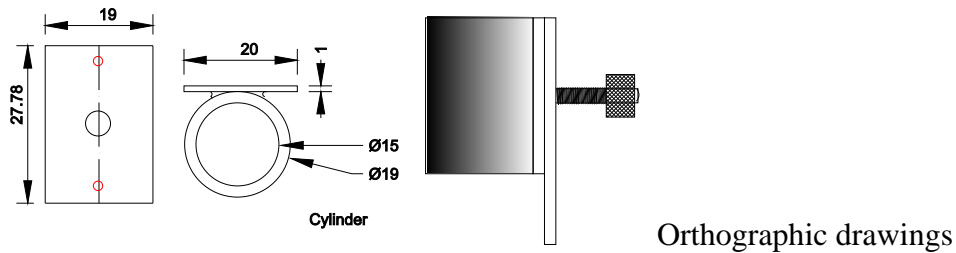
Isometric drawings showing how parts fit together

CAD drawings of some of you project – 2D or 3D

Materials/parts list

Plan for manufacture.

1. This is the time to select from your initial ideas the best of them and bring these together into a single design that you will make. They might be the best because:
  - a. They best meet your requirements
  - b. Are most liked
  - c. Look the best
  - d. Provide a very good solution to the problem
  - e. You will be able to make them to a good quality standard.
2. Good design is always a compromise, now you have to turn your ideas into a practical project.
3. **Everything is made up of many smaller parts, you have to design EVERY one of those parts and show how to make them and how they fit together.**
4. Take each part starting at the top or the bottom and work through the product part by part: E.G The base box to contain the battery and LED's. Consists of a base and 4 sides and a top. They all need drawing. The batteries and LED's are fitted in somehow design how. Generally when you buy things the parts inside don't rattle about – neither should yours.
5. So you will need to decide exactly how the project will be constructed. This will mean considering **each part** of the project and how they fit together.
6. You will need to decide on sizes for each part. The Materials needed, how that part will be made.



## Modelling

1. This is often the time to make some models to experiment with how things work or how big they need to be. Any modelling you do should be photographed and included in this section with note explaining what you learned from it.
2. The final design will be drawn as working drawings. Usually 3 orthographic views of the whole object and of each part so that the correct dimensions can be marked on them. This is a good place to use 2D design CAD.
3. Decide on the materials required.
4. Decide on the construction techniques you will use
5. Make a table showing all materials, what they are for and how much you will need. A costing can be done now as well.

## Industrial Practices.

Industrial methods of production – **SHOW HOW THESE WOULD BE APPLIED TO YOUR PROJECT – DO NOT JUST COPY THIS OUT:**

### One-off

- ❑ Also known as job production. This involves designing and making single products usually for a special order. This can also be known as a commission.
- ❑ For example, a fashion designer might produce a specially-ordered suit for an individual person.

- ❑ The process is usually labour- intensive and involves limited mechanisation. The products are usually very expensive.

### **Batch production**

- ❑ Also known as small scale production or low volume production
- ❑ This is where small quantities of the same product are made. They are usually made to order and there may be some opportunity for the client to select options that meet their needs.
- ❑ Some mechanisation and jigs may be used to improve accuracy and to speed up production.
- ❑ Examples of batch production include boat building, specialist sports cars, a range of bread produced by a local baker, and designer fashions.

### **Mass production**

- ❑ Also known as repetitive flow or volume production
- ❑ This involves producing large quantities of identical products. It may include mechanised or automated production lines. In many cases, special moulds, dyes and automated production lines may be used to speed up output.
- ❑ The production of large quantities of the same product reduces costs to the consumer Televisions, computers, high street fashions, tins of baked beans, cola drinks and birthday cards are just a few examples of this enormous range.
- ❑ You should also think about how each of the following might be relevant to your product in an industrial context, and how each might be undertaken:
  - Research and development that might include market research and the testing of prototypes.
  - Meeting deadlines set by your clients.
  - Different approaches to making which could include sub-contracting or the use of jigs/templates to aid marking out and promote accurate assembly.
  - Independent testing that might include market trials.
  - The use of ICT to provide greater quality and accuracy in designing and making.
  - Environmental issues — use of resources, waste disposal, pollution, recycling.
  - Quality control and assurance.
  - Health and safety issues including risk analysis.

### **Plan for manufacturing.**

This is a list of step by step things you will have to do to make the project. You can use the following general headings but will need to put the detail necessary for YOUR project under them.

<i>Marking out</i>	<i>QC Check measurements</i>	<i>QA Use of templates – Use of CAD</i>
<i>Cutting out</i>	<i>QC Cut on waste side of the line and check each part for size.</i>	<i>QA use of jigs - Use of CAM</i>
<i>Finishing to size</i>	<i>QC checking for fit and accuracy.</i>	<i>QA use of jigs to guide tools. Use of CAD/CAM</i>
<i>Assembly</i>		<i>QA Use of jigs to aid assembly</i>
<i>Test</i>	<i>QC testing finished product against specification.</i>	

Note that for each step you should detail the QA/QC checks you will do. (see below for meaning of QA/QC) **Select one or the other QA or QC in general you would not both.**

### **Quality Control and Quality Assurance (QA - QC).**

You should identify where you will use quality control and or quality assurance techniques in you work.

**Quality control.** – This requires that you check each part to make sure it will do what it is supposed to do, often a check of size or fit with another part.

**Example.** It is the right size, it performs the correct functions, e.g. a motor turns the right way. If the part fails then some remedial measures need to be taken to fix it. If this is impossible, say the part is too small then it will have to be remade.

### **QC is costly in time and materials.**

**Quality Assurance** – This requires that you use some sort of planned action to make sure that all of the parts of the project will be made correctly. This may mean making a jig or template, once this has been proven to be correct it will allow the construction or assembly of the same part many times and each time it will be correct because the jig or template guides what you do.

**Example.** A jig to make sure you drill the holes in the correct place. The used of CAD – CAM, once the file has been produced then many more of that part can be made by the machine and they will all be the same.

This is much better because any costs are minimised by the reductions in errors during construction.

**Jig** – A tool used to help you make or construct parts of your project

**Templates** – A drawing aide to help you mark out your parts.

**CAD** – Computer aided design, a computer programme (e.g. 2 D design) to help you to draw your parts.

**CAM** – Computer aided manufacturing, A machine that uses the Cad drawings to manufacture parts.

**Rapid prototyping** – A machine that can quickly manufacture models and sometimes real parts in 3D – sometimes called a 3D printer.

**The development ends in:**

- a) The production of orthographic working drawings of **each part of the product** with all *dimensions marked on them*. These should show enough detail such that another person could make the project if required.

Use **Orthographic drawings** and if possible an exploded drawing to show where each part fits.

- b) A materials list so that the correct materials can be ordered.
- c) A plan for making showing a step-by-step plan to make your project, this should be detailed. Details of quality assurance and quality control should be included. Some idea of time should be included – be realistic. You can/will refer to the orthographic drawings of each part you have already put in your folder.

**If and when you have to change your plans or your design you must note down these changes and record why you have had to make them. There are marks for doing this – in fact you lose marks if you don't**

**Possibly because you:**

- Underestimate the amount of time needed
- Find a different and better way to make some part of the product.
- Find that a process you planned to use isn't available or isn't working as well as you expected.
- You have to use different materials because of availability or because they are better for your purpose.
- You have changed the design because what you are trying to do isn't working.

### Testing your product.

The first testing should be to make sure your product meets the requirements of the specification.

**Take each specification point in turn and list them showing what you did to test this point and how well your product meets it.**

You might test some parts of your product for durability.

You might ask for the opinions of others

You might be able to approach an expert who can give you an evaluation of your product and design. (this expert may be a retailer or a designer you know)

All testing should be planned and the results recorded.

The best way to do this is in a table.

Example:

<b>Function</b>	<b>Test</b>	<b>Pass/Fail</b>	<b>Comments</b>
Stability	The candlestick should recover if tilted to 20 degrees		
	The candle stick should hold a 50 mm diameter candle without falling over.		
Good quality finish	Here should be no scratches on the acrylic visible to the eye.		

Etc.

## **The Evaluation:**

### **Writing your evaluation report**

Your evaluation report is a collection of the thoughts, reflections and judgements you have made during both the designing and making stages of your project. In particular, consider how these choices and changes to your work have improved the final outcome and what you have learnt from this experience which will make you a better designer in the future.

You might consider splitting your report into two sections to reflect the two different stages of the process, ie:

- 1 Evaluating throughout the process of designing and making. This includes evaluating the appropriateness of your starting point, your initial research, design ideas, development, plan of making and the actual making of your product.
- 2 Testing and evaluating the performance of your final product. For this to be thorough, your project needs to be completed and capable of being tested and evaluated by the client, in the environment for which it was designed.

### **The process of designing and making**

This is not a description or diary of what you did, or how you did it. This part of your report should focus upon those aspects of your designing and making where you had to make choices about your project or reconsider your proposed intentions. If you pull together the comments you have made in response to the evaluation points of this handbook, you will find that you can write a couple of sentences or a paragraph on each of the parts of your project. Use sketches or photographs to support your views and opinions.

Consider the following questions:

#### **Designing**

- Explain your reasons for selecting your starting point. If you were to tackle this project again, would you still think it was a suitable choice? If not, what would you do next time around?
- Discuss the most successful and least successful parts of your research. Were there any significant gaps in your research that you discovered as the project developed?
- Was your design specification as detailed as it should have been? What might you have added?
- Did your initial ideas meet your design specification?
- Which ideas did you choose to develop and why?
- What were the views of your client about your initial and developed ideas?
- What were the most important/successful features of your final design?
- What were the least successful features?
- Did your final design fully meet your design specification?
- Did you leave anything out of your design specification?



## **Making**

- Why did you choose the particular materials, ingredients or components for your final product?
- Would you reconsider the materials and processes you used due to problems you encountered whilst making?
- During the making of the project, what parts were you pleased with and why?
- What aspects of your making could be improved and how?
- What new skills did you learn? Did your lack of experience in the application of these skills limit the quality of your work?
- How did you manage the time available for this project? Could you manage your time more efficiently in future projects?
- If you were to repeat the designing and making of this project, what would you do differently second time around? This part is essential – no evaluation is complete without suggesting some improvement to what you have done.

## **Evaluating and testing the final product**

Here are a set of questions you might ask about your work when you are evaluating and testing the final product.

Write a sentence or paragraph about each of these questions to produce your final report- Use sketches or photographs to support your statements.

Consider the following questions:

- Look critically at your final product- What do you believe to be its strengths and weaknesses?
- Does it work as you had intended? If not, why not? To what extent does it meet your proposed intention?
- Is it easy to use?
- Have problems arisen due to constraints around materials or your limited skills and expertise?
- Does the visual appeal of the product match the intended vision of your final design? If not, why not?
- Test out your product in the most appropriate way Gather the opinions of your client(s).
- Does your product meet the needs of your client(s)?
- Is your product cost-effective?
- Are there any environmental concerns?
- How could your product be improved? You could include sketches of your proposed improvements.

Final note about your evaluation report When writing evaluation reports, remember that you are reflecting upon what you have learnt about designing and making as a result of the project.

Your teacher or the examiner does not want to hear “... everything went well” as we all know, this is not what happens in the real world. Your teacher and the examiners are looking for your ability to analyse the project. You need to draw out, in a thoughtful and critical way, those aspects of your work that informed your thinking and prompted changes in direction. It is this flexibility and confidence to make sensible changes in direction as your work evolves which will signal that you are a good designer and also impress the people who mark your work.

**IF YOU FOLLOW THIS HANDBOOK and IF you produce good quality well finished and complete work you have every chance of achieving the highest grades.**

**If you choose not to do so you will not achieve the grades you so easily could.  
The rest is up to you.**

**For information on DT basics check out the shared drive Drive S where you will find some information in the DT folder.**

**There is also a database CD ROM for DT available on the system.**