

# Candidate Style Answers

## **GCSE Design and Technology: Resistant Materials**

OCR GCSE in Resistant Materials : J306

Unit: A561

These candidate style answers are designed to accompany the OCR GCSE Resistant Materials specification for teaching from September 2009.

# GCSE Design and Technology: Resistant Materials

## Unit A561 Controlled Assessment

---

OCR has produced these candidate style answers to support teachers in interpreting the assessment criteria for the new GCSE specifications and to bridge the gap between new specification release and availability of exemplar candidate work.

This content has been produced by senior OCR examiners, with the support of the Qualification Manager, to illustrate how the sample controlled assessment task might be answered and provide some commentary on what factors contribute to an overall grading. The candidate style answers are not written in a way that is intended to replicate student work but to demonstrate what a “good” or “excellent” response might include, supported by examiner commentary and conclusions.

As these responses have not been through full moderation and do not replicate student work, they have not been graded and are instead, banded “medium” or “high” to give an indication of the level of each response.

Please note that this resource is provided for advice and guidance only and does not in any way constitute an indication of grade boundaries or endorsed answers.

**OCR Exemplar portfolio. Unit A561. Controlled Assessment. 20 Hours**  
**Theme: Celebrations – Decorations, awards, trophies, promotional items. Product must be 3D.**

**Creativity**

**I am very interested in sports and followed the success of the British teams in the 2008 Beijing Olympics. I think it is very exciting that we will be hosting the next Olympics in 2012. This has given many designers / architects / town planners the opportunity to be creative. One of the first challenges was to design an Olympic Logo and manufacture batches of promotional badges. This logo would also be transferred onto many other products from mugs to pencil cases. The products produced over the next 4 years will raise a great deal of money. These products are purchased by sports persons, sports fans, Olympic supporters, sports memorabilia collectors, limited edition collectors and thousands of interested people as a memory of the fact that they were part of such an important event.**

**I have chosen the Olympic badge as my starting point product. This design has been quite controversial. It was not very popular when it was first launched, but I now feel that people are beginning to accept it.**

## Existing Products - Promotional badges



### Shared functions

These badges are worn by people who want to show that they support a cause, a group, an organisation.

What do they have in common?

- They are easily recognisable.
- They do have 'variations' based on the same image – different colours – different products / same image.
- They have economy and luxury versions. Usually they are inexpensive. Some rely on donations, some have a fixed price. They are usually made from base, inexpensive materials so that maximum profits go to the charity or organisation.
- They are designed to be worn by a wide range of consumers. Old, young, male, female. The breast cancer badge promoting the colour pink is predominately worn by women which is to be expected. This is a very successful promotion of product. It has developed from a simple looped ribbon on a safety pin to a sterling silver' collector item 'range.
- They are eye catching
- They are simple. No text. They rely on shapes and colour to communicate the message.

### My thoughts

Is the criticism aimed at the 2012 Olympic badge because it is not easily recognised? Is it because people couldn't make out what it was? Is it because you could really see the Olympic rings – an image we are all familiar with and has been used for generations? I will investigate this further.

## Existing Olympic badges / emblems



The logo consists of a white olive wreath on a blue background. As with the Beijing emblem, the simple and minimalistic design contains a deeper symbolic meaning common to the hosts. The logo is directly related to the Olympic Games history. The olive wreath, known as a kotinos, was at the time, the most prestigious and honourable award. This in addition to the fact that the olive tree is a sacred symbol of Athens, the emblem therefore reflects a city where democracy and civilisation were founded.

The circle shape of the wreath is said to represent the world's unity and connects both the past and present. Even the colour selection has a deeper meaning, the blue and white palette represents the Greek landscape and its lack of solid colours reflects Greece's fluid landscape and blue skies.

Its unveiling in 1999 saw the people of Greece applaud its arrival. They supported the symbolic meaning behind it and generally felt that it truly represented Greece and its values. The positive sentiment surrounding the emblem was supported around the world and soon became easily recognisable.



This emblem is the official Olympic pin of the 2008 Games centred in Beijing.

The logo, entitled 'Chinese seal- Dancing Beijing'. The pin features a character on a traditional red Chinese seal with the words "Beijing 2008" written in an eastern-style brush stroke.

The stick-figure represents a lively runner or dancer and also relates to a Chinese character 'Wen' meaning humanity or culture dependent on its context. Officials also relate the figure to the famous character 'Jing'- meaning Chinese capital or Beijing.

Since its unveiling in July 2006, the badge has had very positive comments and press about it. In my opinion, the design conveys a simple image but embodies many messages, the fact that the design is not definitive and can be interpreted differently is especially unique. I feel that in terms of the design I hope to create, I wish to include features such as this and evidently gain the positive feedback similar to this product.

How does the London Olympic badge compare?

I decided to ask a range of different people what they thought. What sort of product they would like. I would then include these views in my design specification. All the people I asked would wear an Olympic badge in support of the games. All had already worn badges for Children in Need a Red Nose Day. They did want something that was easily recognisable like the previous emblems – depicted the country in some way – had some historical or cultural link... not just a collection of shapes.

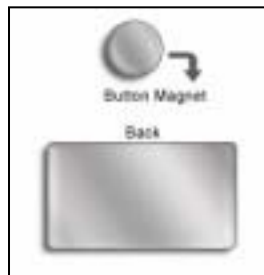
## Designing and making a badge – things to consider



Pin and clasp. This is the most widely used. The back of the badge contains a spike soldered onto the plate. This spike is then pierced through the garment leaving a minute hole due to its tiny diameter. A clasp is then put over the spike and a leverage system within the clasp tightens and therefore prevents the badge falling off. To remove, firmly depress the leverage system and pull from the garment. In terms of my product, if I selected this method, I would have to separately purchase the clasp due to the difficulty and impracticality of producing them in a school workshop



Bar pin. This pin is similar to the above only this is a self contained unit, there are no other attachments needed. Again, due the impracticalities of making one of these, this is a feature I would purchase separately and incorporate into my design. This design features a rotary lock that prevents the pin from falling out. It works in the same way. The pin pierces the garment leaving a minute hole and is pushed securely into the lock system. I personally feel that this pin is ideal for my design as it has the safest mechanism to prevent the product falling off, and due to the materials that I hope to use the product may weigh a considerable amount increasing the potential to fall off.



Magnetic Clasp. The fabric never gets damaged with this design. A small but strong magnet is placed on the underneath of the garment and the magnetic plate is the design on top of the fabric. This method does have problems – the clothing must be quite thin for the magnet to have the required strength. If the fabric is too thick, the pin will keep falling off. Magnets can interfere with mobile phones. I will not consider this method for my design solution.

### Available Technologies.

I have made some jewellery in year 9 and I really enjoyed it. We have got facilities to cut out shapes from sheet metal and plastic. I have seen examples of etching metal. I can silver solder non ferrous metal together. I could use wire to obtain shapes. I could use the CAD CAM milling machine to mill out shapes – ( Not sure how small it will go) . I could use resins to add colours to my design. The problem, I think is going to be the size.

## OCR Exemplar portfolio. Unit A561. Controlled Assessment.

Theme: Celebrations – Decorations, awards, trophies, promotional items. Product must be 3D.

### Designing

**Design Brief:** I would like to design and make a prototype model of a badge for the London Olympics in 2012

#### Design Specification

**Function:** My product must both be an attractive, contemporary design and also promote and advertise the London 2012 Olympic Games.

**Ergonomics and Anthropometrics.** My product must contain a simple mechanism in order for easy operation i.e. attachment/removal from garment. The clips and catches used must not interfere or restrict the garment worn.

**Safety.** The product must be completely safe to wear, both in terms of design and material. When selecting materials, I must consider that due to the nature of my product, skin contact may occur and therefore the material must meet the necessary qualities i.e. non corrosive, not irritating. In terms of design, I must avoid sharp edges and snags in the material that may cut or be abrasive against the skin.

**Aesthetics.** The product must reflect contemporary design and be fashionable by its target audience. It must incorporate recognisable aspects of the Olympics, e.g. 5 rings, as well as being representative of London. The colour scheme should also be considered with relation to the colour association that the Olympic rings have attained i.e. the colours of the 5 competing continents- red, blue, black, yellow and green.

**Materials.** The material I choose to construct my product must be functional and look good. They must be cost effective to produce. I may make the badge from a material that would be different to the one used in industry. Most badges would be cast, and I don't think I can do this process at school. The material must cope with different environmental conditions like rain.

**Environment.** My product must not be restricted to indoor wear. Therefore the materials I select and the construction of the product must be able to withstand the elements. It must be both water and moisture proof to resist rain exposure and humidity. The product must not discolour in the heat of the sun.

**User Group-** The consumer must be happy to purchase the product and not feel embarrassed to wear it.

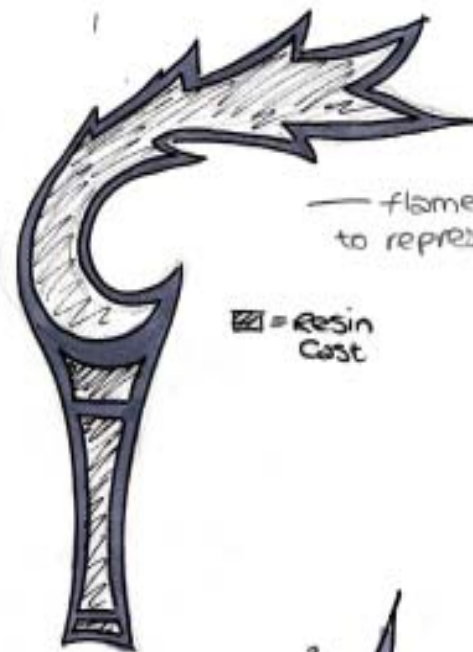
**Life expectancy .** The product should be designed and built to last. It is really annoying when products break.

**Costing.** The costing of the product will depend heavily on the material and process used. The prototype model will not cost very much to make due to its size.



follow appropriate finishing steps to achieve a high polished - chrome like finish

fill concave shapes with selected resins

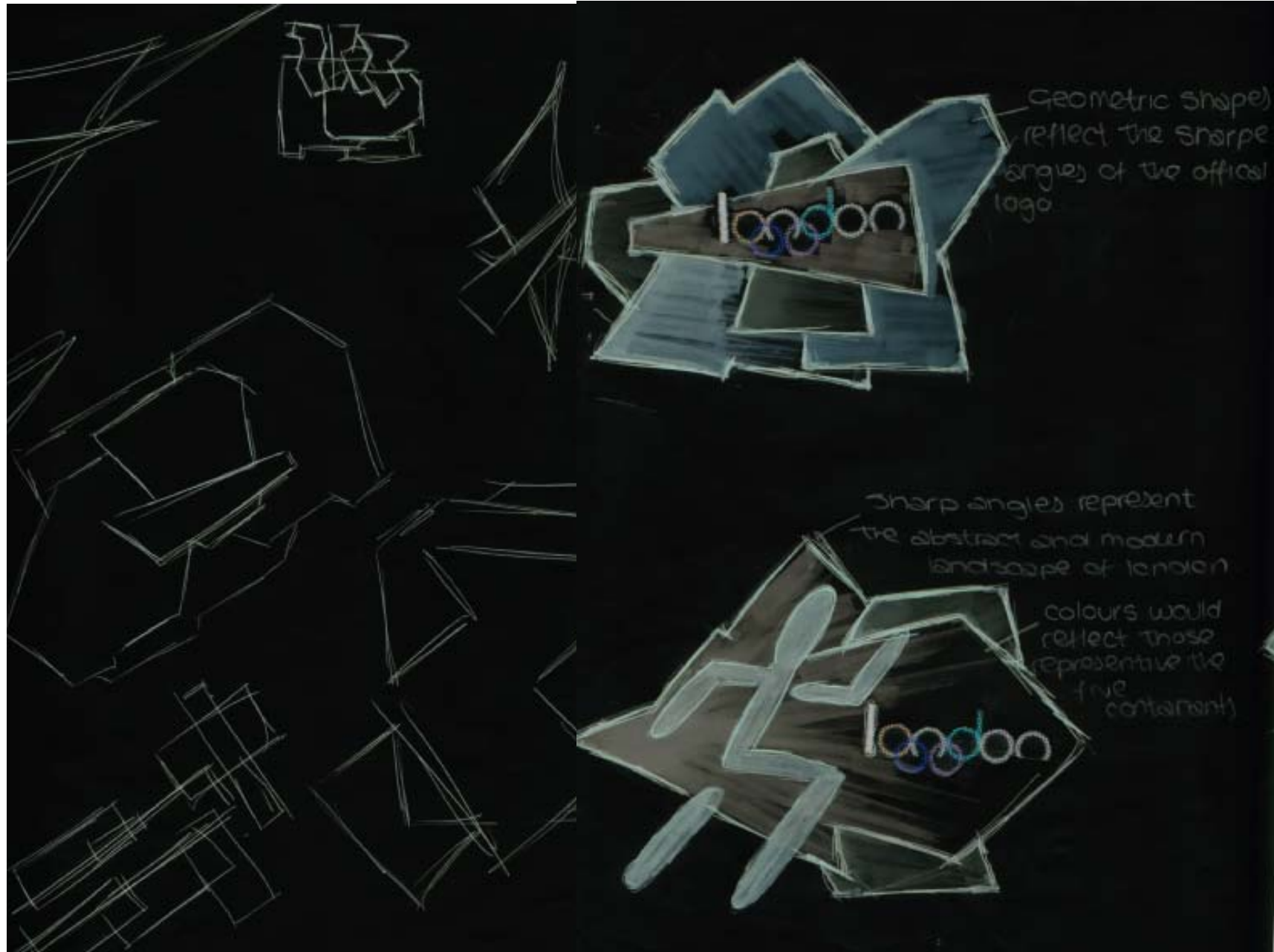


flame in an 'L' style to represent 'London'



Ideas based on the Olympic flame





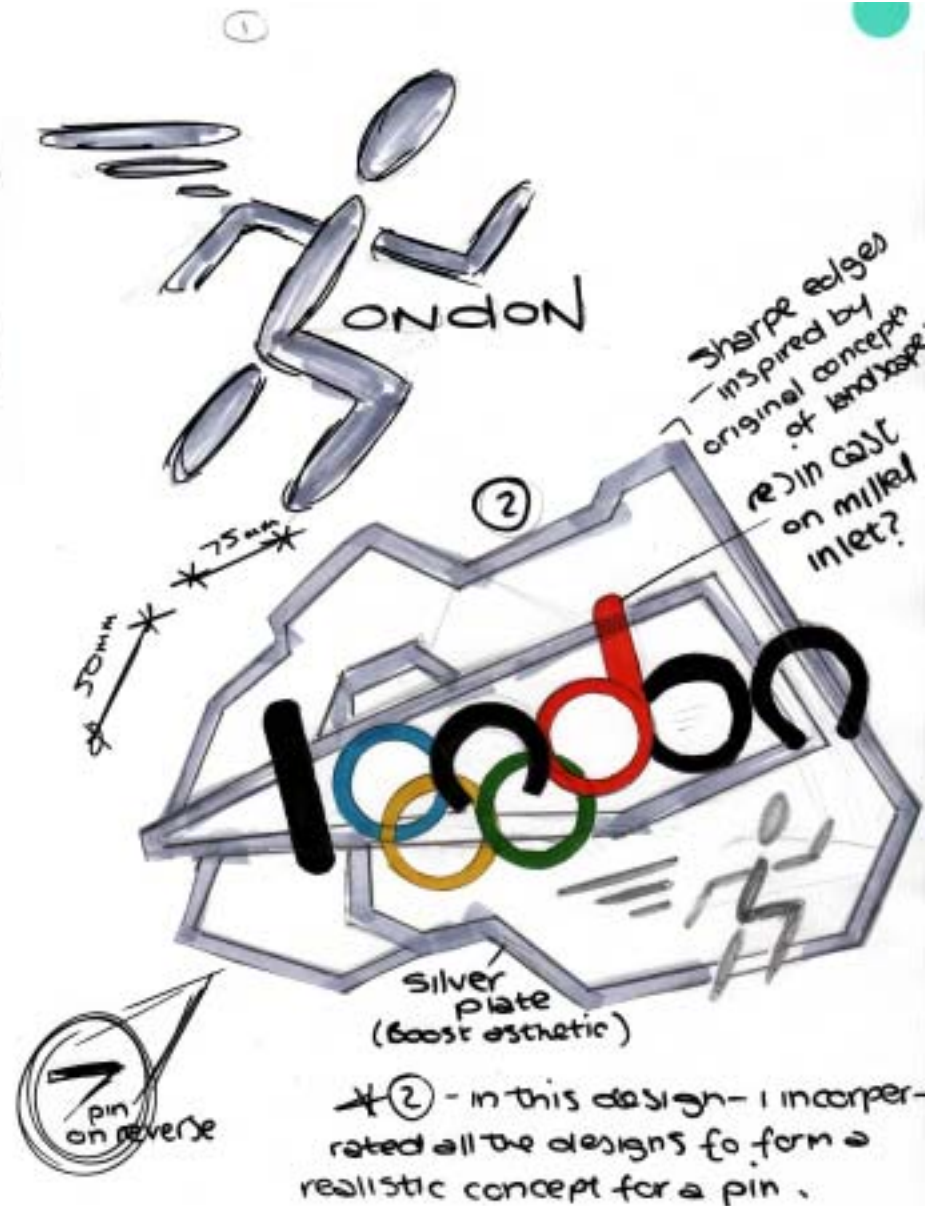
## Images I like and may develop



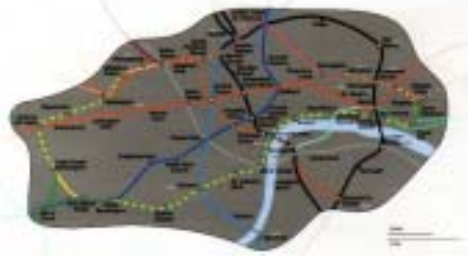
These characters were used in the Beijing Olympic games. It is important not to favour one sport over another in the main Olympic Badge.



This design idea of linking London with the Olympic hoops was part of the original submission but was overlooked. I would like to develop this design somehow.



Inspiration images



mood board



① - initial concept: London

circles representative of stations/stops.

②

developed concept (inclusion of underground map).

③ - rough computer generation.

(note: I incorporated the previously developed logo - I feel this really works well in colour context and is visually stimulating.)



## Final Idea



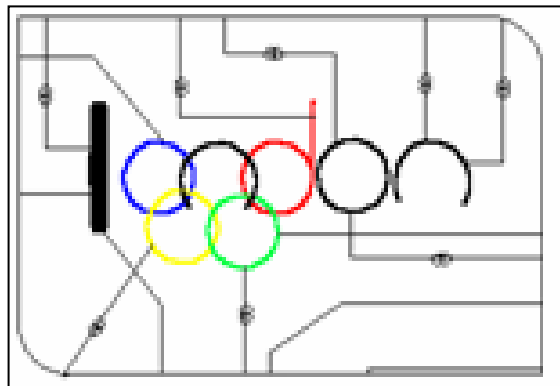
Initial concept of what the design could look like. My preference for this design is due to the fact that it matches my design specification. It is aesthetically pleasing. It represents London. The London Underground is world famous. The coloured 'map system' has won many design awards. With the inclusion of the previously developed concept, the word 'London', the design provokes the official Olympic symbol incorporated in the word London.

I want to experiment with methods of how I could produce such a complex design on such a small scale. I have seen some GCSE work from students last year who used liquid coloured resins. I also have an idea about using CAD CAM to carve out the grooves of the underground map.

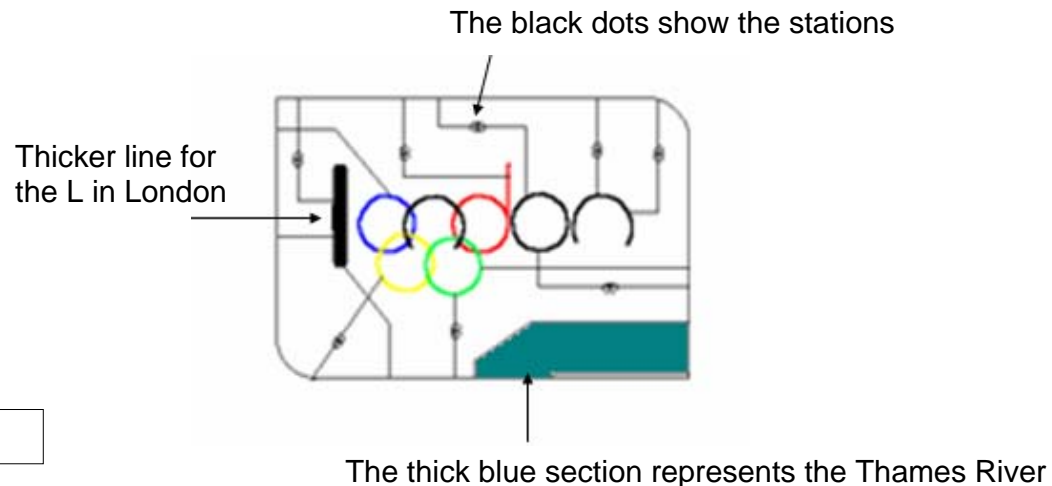
This is the idea I would like to develop into a concept model.

### Turning my design into a badge

When I have decided on the materials for the front of the badge, I will have to work out how to attach the brooch / badge pin. I can silver solder copper, brass and silver. I will have to glue aluminium with epoxy resin if I use it, and acrylic plastic with fusion glue.



Drawing the image on the computer



## OCR Exemplar portfolio. Unit A561. Controlled Assessment.

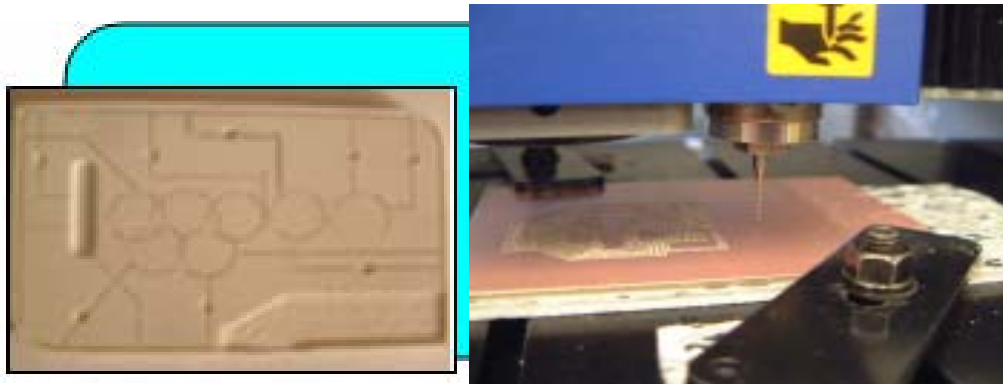
Theme: Celebrations – Decorations, awards, trophies, promotional items. Product must be 3D.

### Making

### CAD CAM Testing

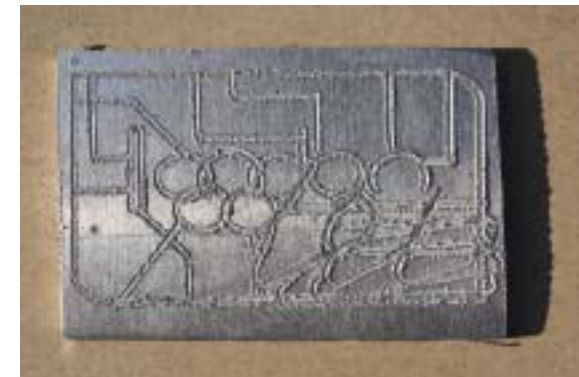
A crucial section in the manufacturing of my product is the process of milling my design onto the silver sheet. As my experience with both the Cad/Cam software was limited, I used this section of my time wisely to try-out and understand both the machine and its designated programme. During this experimental stage, I used scrap PVC as this was a cheaper alternative to using metal. A vital task was to produce an exact replica of the design using the software enabling the machine to mill it out with precision.

I was limited by the diameter of the tool used for the thickness of the lines. The smallest was 2mm. I experimented with the engraving tool, which had a sharp point that could create very narrow lines.



Results using PVC plastic

Milling tool- designed for surface removal  
Engraving Tool- designed for outline/shallow channels



Aluminium sample.  
Engraving tool left burrs around the cut.

### Resin Casting

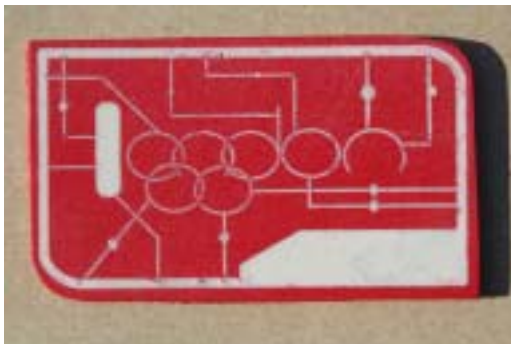
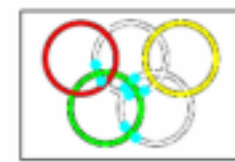
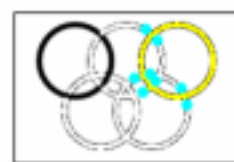
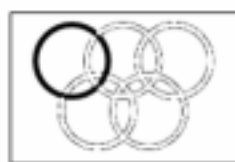
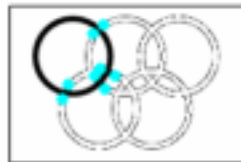
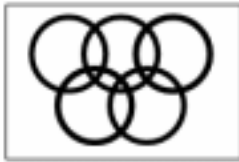
The next stage was to investigate resin casting. Now that I had a PVC mill out of my design, I followed the method sheet and produced a liquid resin and evaluate its standard.

## Testing and evaluating resin casting

One of the initial tests I conducted was resin casting. liquid resin is produced by mixing the resin with a hardener and coloured pigment. The chemicals are strong. Had to be done in ventilation. The problem I hoped to prevent was the cross contamination of the different coloured resins.

The design would be milled in one deep channel and when adding the resin to the piece, the liquid would run and fill all the hoops. My task therefore was to experiment with methods of preventing the colours from mixing by separating the design into compartments.

To prevent the resins from running into one another, I had to develop a way of temporarily blocking off each over lap on the design. I began experimenting with plastacine, it allowed me to make a perfect block between overlapping channels. I cast one colour, allowed it to dry, removed the plastacine, and repeated to the end. It took ages.



Photograph of my test. - Flooding white resin only into milled plastic



### Problem

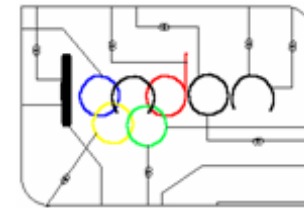
This is still too big for a badge that people wear. I can't get it smaller in the school workshop. We do not have the facilities. It all becomes too fiddly to do by hand. I have measured a range of badges and they tend to be no bigger than 40mm X 30 mm. this test piece measures

## Test 2 - Resin casting onto a printed computer image

There was a test I wanted to carry out using a new material that I didn't have any experience with. Crystal Resin. My teacher ordered it for me. It was similar to normal casting resin, but instead of adding a coloured pigment, this chemical leaves a transparent finish.



Finished test piece



Computer drawn image

To conduct this test, I used a computer generated replica of my initial design:

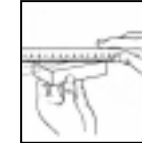
I then used scrap acrylic to create a base for the design and stuck it down. I then built a tight frame around the design using thick card. To create a complete seal I used tape. After mixing the solution, I poured it on top of the badge.

The photographs shows that the process worked. My only problem was that the wet solution was partly absorbed by the paper, slightly discolouring it.

The computer generated design is some ways better than milling. The design is smaller and easily recognisable.

## Plan for Making my prototype.

- Get a sheet 2mm aluminium.
- Using a scribe and steel rule mark out exact measurement
- Using hack saw, cut along outside edge
- File edges to using cross file until saw edge is smooth
- Cover the back of aluminium in double sided sticky tape using craft knife, cutting mat.
- Make sure milling plate is clean of debris to ensure firm hold. Place in left corner of miller. Close lid.
- Open design in pro desktop software. Create cutting path in virtual model. Select cutting parameters for the material. Reference XYZ positions. Start cutting.
- When milling is complete and safe to remove, open lid
- Using a soft brush and needle file gently remove the loose material left by miller tool.
- Using a craft knife cut a small piece of plastacine and roll into a ball until it measures 0.5 cm diameter.
- Using sharp knife or scribe -Place these plastacine balls into the specified channels of the design to prevent contamination of coloured resins.
- Make sure the badge is flat on a board.
- In a wax cup -Measure 30ml of resin solution. To this add 3 drops of catalyst liquid to the solution. Add colour pigment. Mix the solution all together.
- Fill the channel by dripping off a thin piece of wire.
- Allow to dry completely for at least 16 hours.
- Carefully remove plastacine with a sharp scribe.
- Repeat this process until all channels are full with designated colours
- File, wet and dry the surface until flat and smooth. Polish using brasso.
- Polish the back of the badge on the polishing wheel.
- Mix up epoxy resin glue and glue the brooch pin in place.



## Health and Safety in the workshop

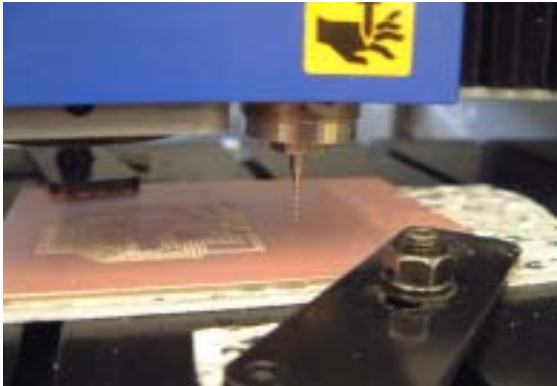
Resin – must be used in well ventilated area. Don't breath fumes. Flammable. Must wear protective gloves

CAM – must make sure the work is attached to the bed correctly. Not allowed to use until set up and output programme has been checked by teacher / technician.

Polishing wheel. – must ask permission before use. Apron. Goggles . Work will get hot due to friction - Do not hold aluminium in a rag.



# Photographic Construction Log



CAD CAM production of milled design

Mixing and casting the resins for each colour used in the design



Hand finishing techniques to achieve a quality product

## OCR Exemplar portfolio. Unit A561. Controlled Assessment.

Theme: Celebrations – Decorations, awards, trophies, promotional items. Product must be 3d.

### Critical Evaluation



I feel that the computer generated image makes it modern

The design uses the word London, the five hoop logo and of course the symbolic London underground.

The product works as a badge and attaches to clothing even though it is a little big.

Everyone who handled and fondled the product found it safe and nice to touch.

The colours used match the official colours of the Olympic Games.

It offers great potential to be extended to a wider product range.

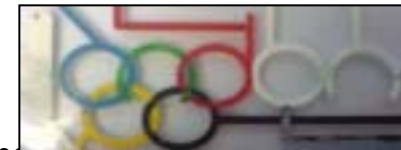
The materials used to make the product are suitable for prototype. In industry they would cast the badge.

The materials used in the product are all completely water proof. The bar pin used at the back is made of non ferrous metals and will not rust.

The product material are designed to last which is good for the memorabilia market

Costing- the pricing for this prototype model was around £4. This budget would be decrease on a batch production scale.

Although the initial set up costs would be expensive, the more badges made, the cheaper the price. I would want the retail price to be between £ 3 and £5 – maybe, like cancer research, a limited edition in silver.



I am really pleased with the end result. I asked other people and they thought it was really good as a concept model, but it still needs to be developed. It is still too big for a badge. But people can get a good idea of what the final product might look like.

The corporate identity I have designed can be relevant on hundreds of current products. The photographs below show how this product can also be worn as a swipe card, with the idea of officials possessing them at the real games.

Where the product is worn alters the function of the product. This same design could be applied to credit cards, top up cards or ticket sales.



Click on image to see video



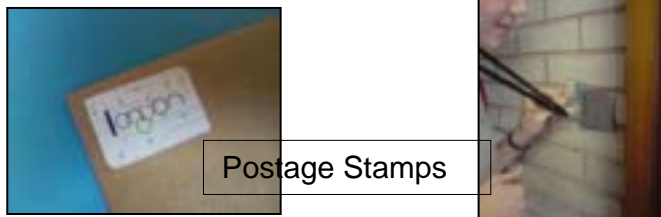
Olympic Based Business corporate image



Drinks Bottle



Olympic Mugs



Postage Stamps

I have really enjoyed this project. I managed to complete the work on time. It was nice to do a lot for practical experiments to see if things would work. I ended up with two models. One badge milled out from a sheet on transparent acrylic and filled with different coloured resins. This involved hand finishing. Filing, wet and drying and polishing. The problem with this design is that the brooch pin shows through, so I made it into an 'electronic' swipe card.

The second concept model of the badge is a computer printed image onto white paper with a n acrylic back plate. Transparent resin was poured on top. The pin does not show through on this one.

## Points to note:

This is an **high grade GCSE Folio for Unit A561. It is suitable for full and short course candidates.**

- All of the assessment criterion have been addressed in each section.
- The use of photographs are an excellent way of communicating what the candidates are doing / have done
- There is no limit on the number of photographs used. ( Minimum 2 photographs)
- Sound bites can be included on e portfolios to help communicate thinking, the practical progress or evaluation.
- Video clips can be included.
- The recommended number of portfolio sheets is no more than 12 A3 sheets or 24 A4 sheets (This exemplar portfolio has 17 A4 sheets.)
- Candidates can submit a hand generated or e portfolio for assessment. Hand compiled portfolios will be posted to the moderator. E portfolios will be burnt onto an individual CD and posted to the moderator.
- It is possible for a centre to mix and match. However, once the candidate has selected a preference, they must stick to it. The moderator cannot accept the designing section on paper and the rest as an e portfolio (hand drawn idea sheets must be scanned onto an e portfolio). OCR recommend that candidates use PowerPoint and Windows Media Player.
- It is important that candidates do not waste paper and fill each sheet appropriately.
- The construction process must show that the candidate has used hand and machine tools, as appropriate, to realise the product.
- The candidate must demonstrate the ability to solve technical problems as they arise.

OCR would like to thank Adam Barrett, a student at St. Paul's School, Leicester for his help in compiling this exemplar portfolio. October 2008

**Assessment of Exemplar Portfolio Resistant Materials. Unit A561**  
*This candidate has achieved maximum marks in each focus area. **Grade A***

Focus Area	Ability Box Mark awarded	Reasoning / Evidence
Creativity	Works competently <b>10 Marks</b>	Candidate selected one of the published themes. Identified a specific product as a starting point to redesign. Identified trends in existing products. Talked about consumer reactions / expectations. Evidence of technical knowledge. Appropriate use of ICT in recording the information.
Designing	Works competently <b>14 Marks</b>	Produced a detailed specification. Appropriate and relevant to the brief. Sketches and notes communicate original thinking and the development of ideas. CAD used to support design development. Final design clearly evident.
Making	Works competently <b>28 Marks</b>	Candidate demonstrates a practical and thorough understanding and ability in solving technical problems effectively. The testing of materials and processes is evident. Plan to show the various activities of construction in logical order. Candidate has produced a well made final prototype product. The Key stages in construction are recorded.
Critical Evaluation	Works competently <b>8 Marks</b>	Candidate has evaluated the processes involved in making the final prototype product. Modifications and product developments are suggested. Information is well presented and include specialist terms