

Family Learning

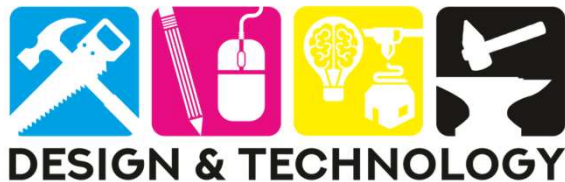
DESIGN & MANUFACTURE

Higher

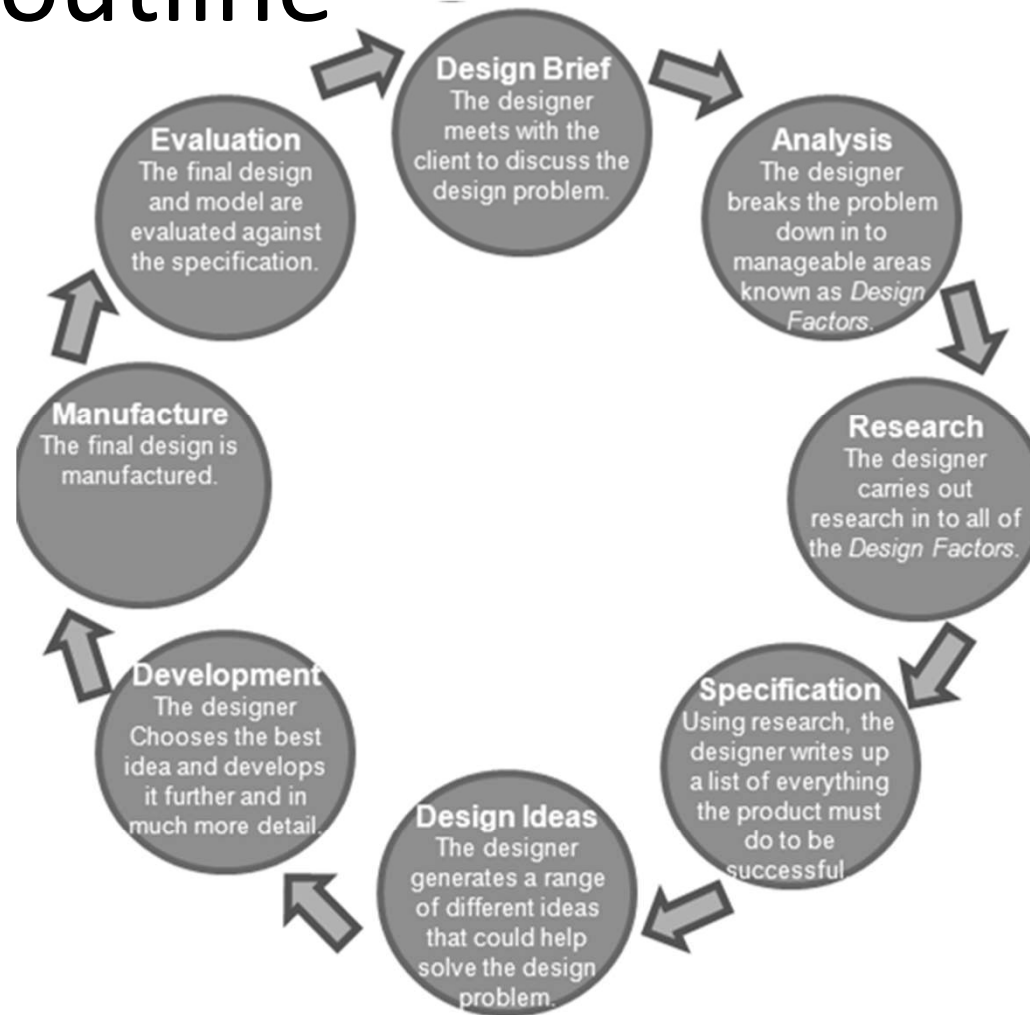


National 5 v's Higher

- **National 5** – Designing to manufacture in a school workshop
- **Higher** – Designing for commercial manufacture



Course outline



Assessment Arrangements

National 5

Assignment 1 (<i>design</i>)	30%	externally assessed
Assignment 2 (<i>manufacture</i>)	25%	internally assessed
Question paper	45%	externally assessed

Higher

Assignment	53%	externally assessed
Question Paper	47%	externally assessed



Assignment Higher

Design brief given from SQA bank

Marks for:

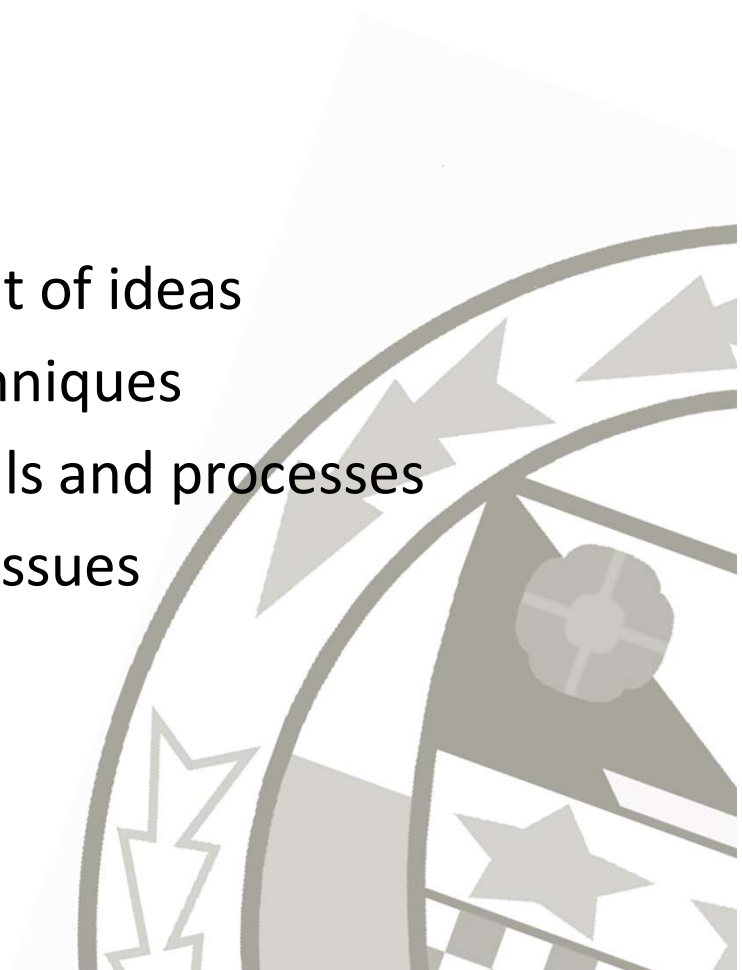
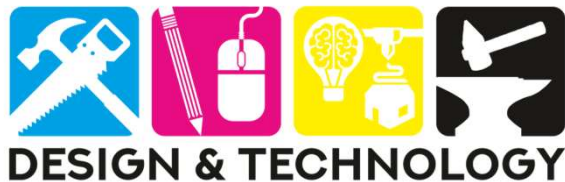
Generation of design ideas

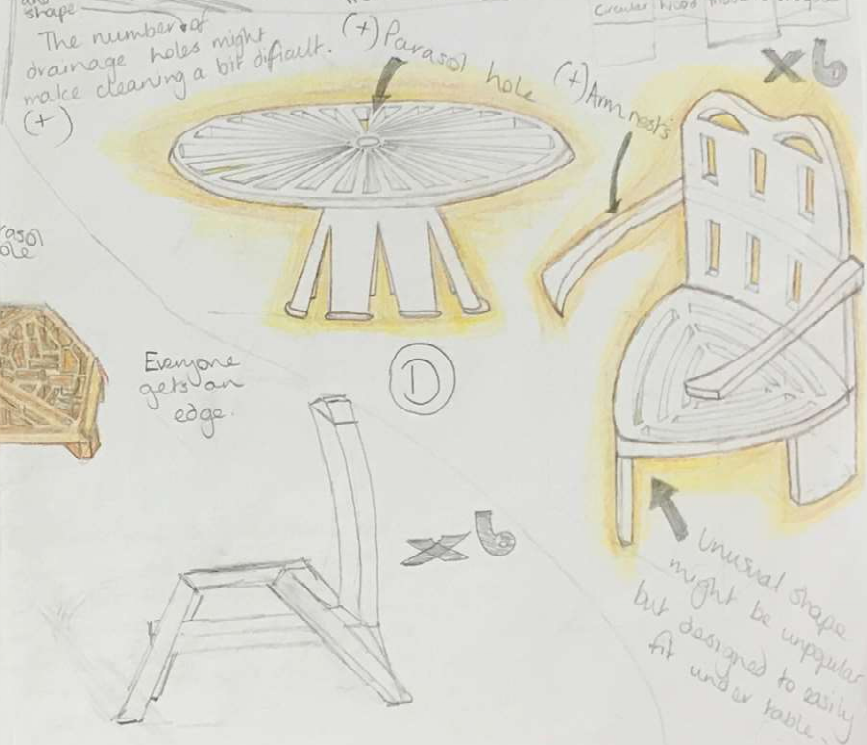
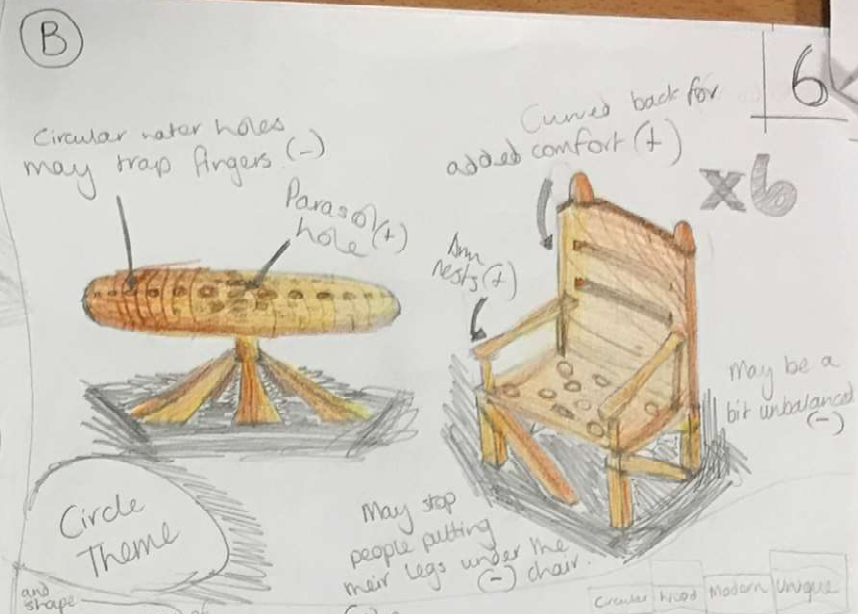
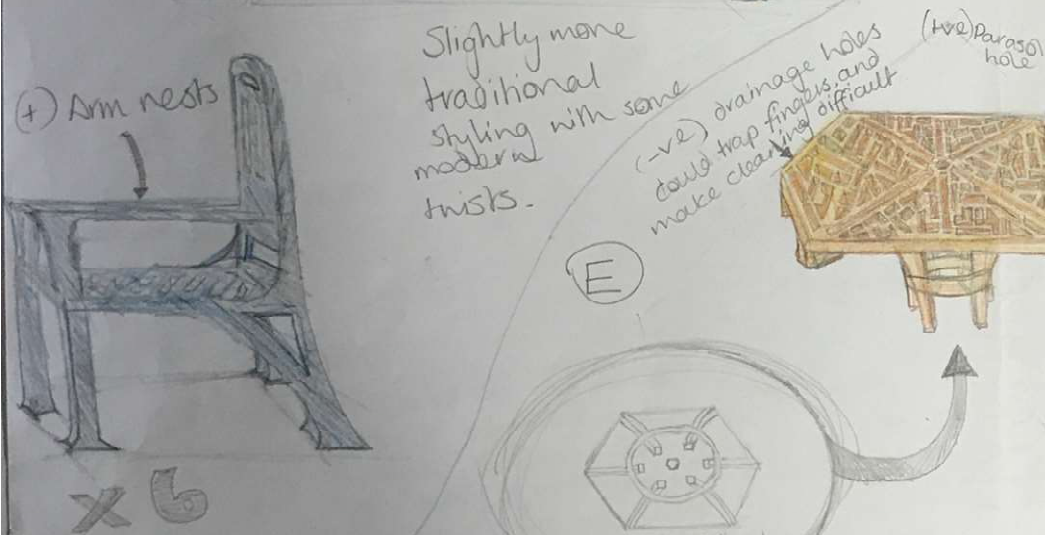
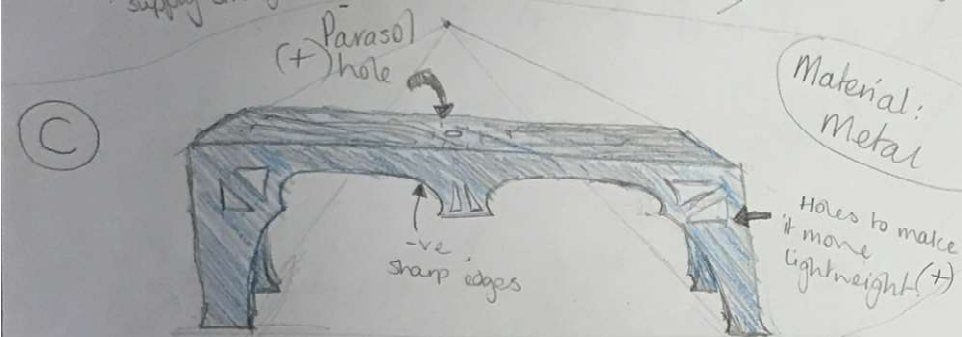
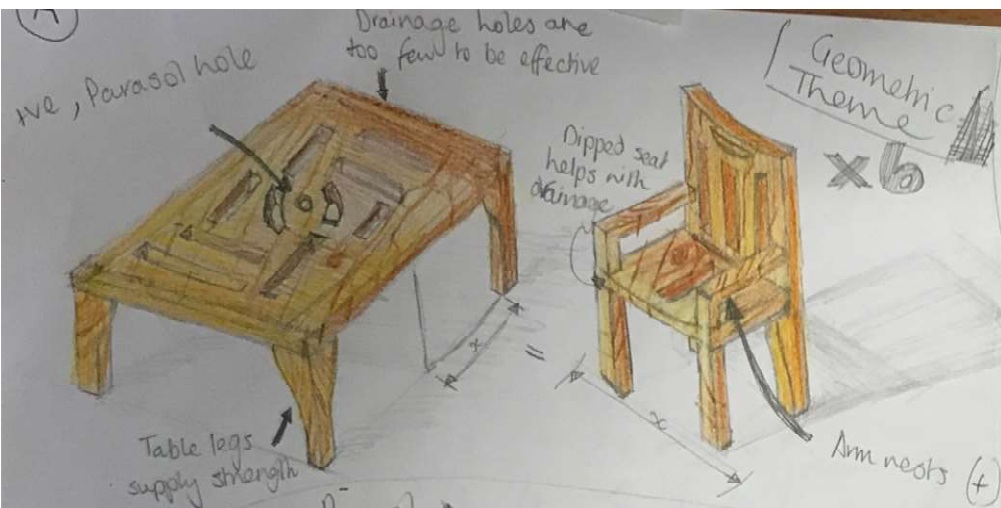
Development, exploration and refinement of ideas

Application of graphic and modelling techniques

Knowledge and understanding of materials and processes

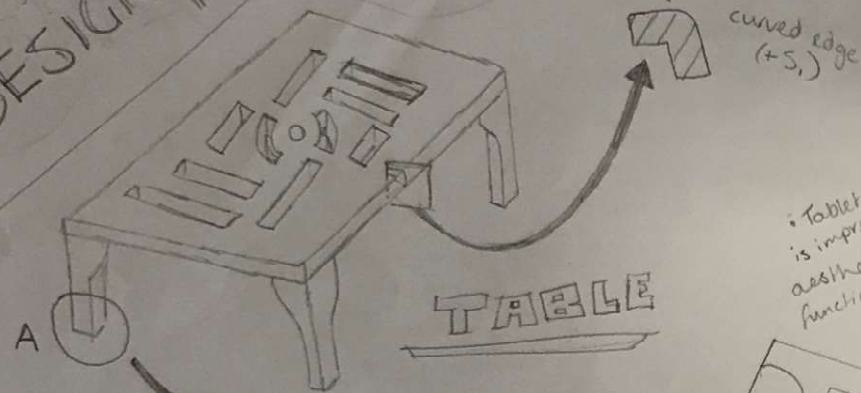
Knowledge and understanding of design issues





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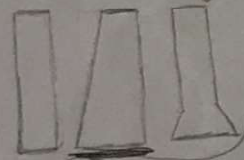
DESIGN



Use adhesive to fix together.

Metal casing for protection on each leg. (+D₁)

Arm rest designs



Modern twist (+A₃)

6 chairs are included in the set

B

CHAIR x6

Possible Joinings:

Could move front legs and arm rests outwards to allow more room. (+E₂)

Dovels

C

Plan



Fork longer than hole

(Holes are not to scale)

The edges of the holes could be chamfered to encourage water drainage and reduce danger of sharp edges (+F₃ & S₁)

The holes cannot be big enough to let cutlery fall through (-F)

More holes to allow for drainage (+F₅)

The more holes, the lighter it becomes (+E₃)

DEVELOPMENT

Back Rest



Holes match with design of table (+A₂)

Possible Joinings



1. - x3 height of arm =
2. - x2 no 1 / x6 height of arm
3. = 1. - x3 height of arm

Material Choice

Wood: Teak (+D₁, +F₁)
- expensive but looks doesn't need additional

Oak (-F₄, +E₃)
- Expensive, durable will last for ages

Eucalyptus (+F₁)
- Inexpensive, durable self-protected

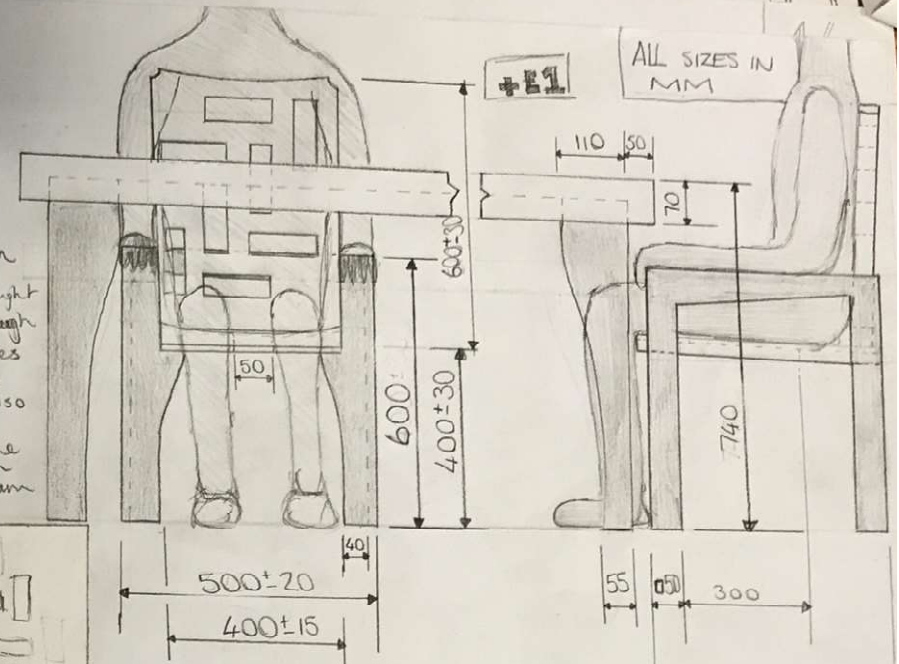
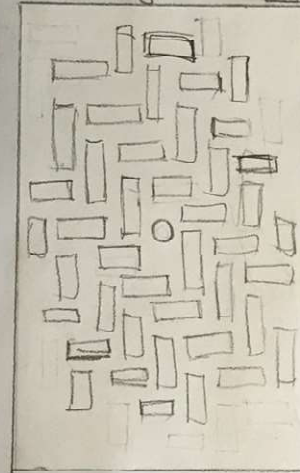
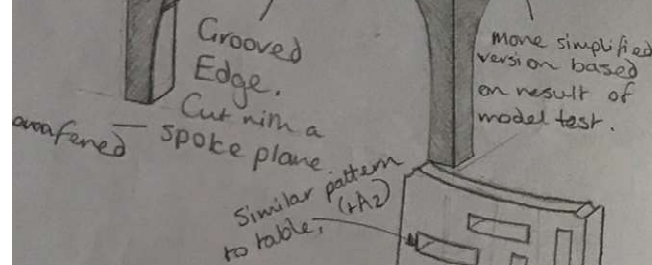
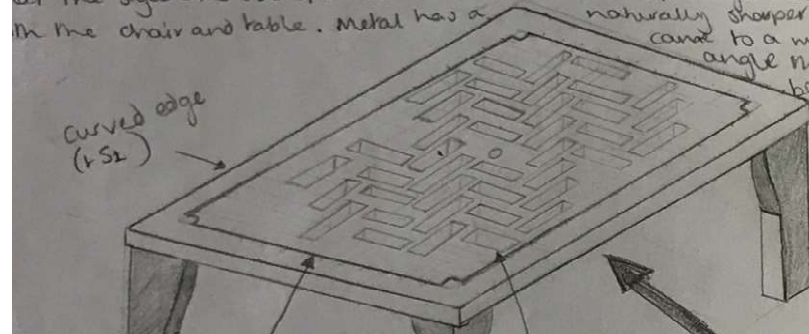
Cedar (+D₁)
- Durable, light expensive

Metal: Steel (+D₁, +F₃, +F₄)
- Strong and durable and doesn't rust.
Expensive but as small protective additions then it should be fine

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FURTHER DEVELOPMENT & REFINEMENT

I chose this design over Design B because I thought that this design met the demands of the specification more specifically than design B in many ways. It surpasses design B in the demands of A₃, A₂, S₁, S₄ + F₅. I thought at the style and use of metal was more traditional and yet was not controversial enough in the chair and table. Metal has a naturally sharper edge and the holes come to a much more acute angle than Design A. I also believed that metal requires more care than wood based on the materials that I am choosing.



• The height and other dimensions of the table are constant.

• The dimensions of the chair have tolerances to compensate for the sizes of the person sitting in it (+E₂)

Length of table - 1400
Height of table - 740
Width of table - 700
Diameter of parasol hole - 60
Length of drainage hole - 100
Breadth of drainage hole - 30
Depth of table - 30

This design compared to the initial one has many more boxes ticked in relation to the specification. I have kept some of the design features from the initial design like the shape of the table legs and the seat on the chair. The features I have changed however are the design on the table top which I think meets A₃ + E₃ more since more holes equals a lighter table and the design is more modern than the first. I have changed the chair into a metal frame base with wooden seat and backrest. The metal frame is wrapped around wooden legs but gives the outward appearance of metal. This meets the demands of A₁ + D₁ better. The metal protection around the legs is repeated in the table legs as well which the chair legs and arm rests have.

Average dimensions	Percentile	Adult (mm)	10 yrs. (mm)
Seat height - floor to seat	(50%) ile	432	331
Seat depth - front to back of seat	(50%) ile	394	30
Seat to top of backrest	(50%) ile	381	27
From top to bottom of backrest	(50%) ile	305	14
Seat to backrest	(50%) ile	102	14
Armrest length	(95%) ile	216	17
Armrest height above seat	(50%) ile	203	11
Seat width	(95%) ile	508	3
Between armrests	(95%) ile	508	3
Armrest width	(50%) ile	51	
Backrest width	(95%) ile	406	2

FURTHER DEVELOPMENT & REFINEMENT 2 :

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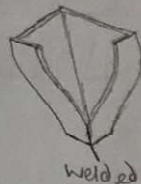
Materials & Manufacturing

For Both Table & Chair Legs

Wooden leg



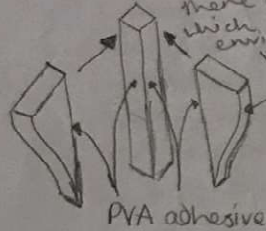
Metal case (Table)



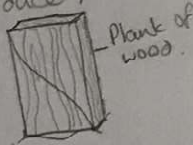
Can be easily mass manufactured
Welded

• Use pressing and stamping process to bend into shape

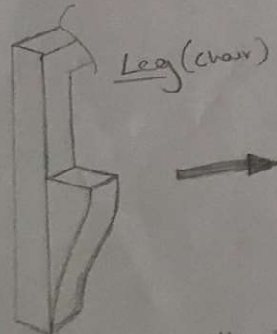
Consistent quality cut each time which means there is no human error which reduces waste and environmental impact.
Curve cut with laser cutter for batch produce



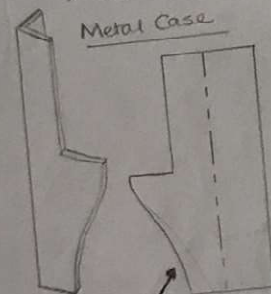
PVA adhesive



Plank of wood



Leg (chair)



Metal Case

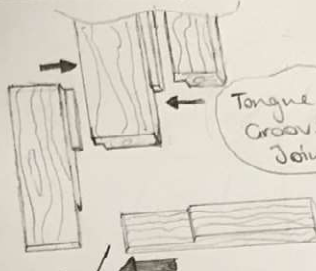
Does not require any - Use the blanking process to cut out shape.

For Chair Base



CORNER HALVING JOINT

For Table Top

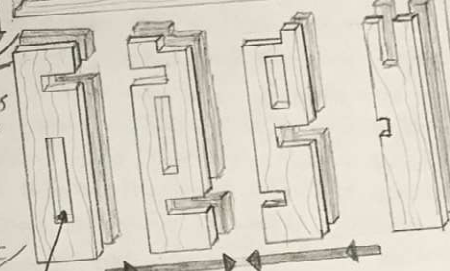


Tongue & Groove Joint

WOOD PLANK ASSEMBLY

For Chair Backrest

Two layers of planks glued together to make the back rest.



Join using PVA

Quite complex in shape as each is unique so the cost to produce might have to be balanced out with the cost of the unit

Cut using a mortise drill
computer controlled to maximise accuracy

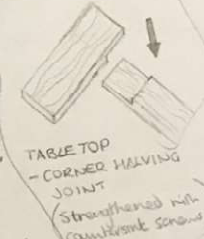
JOINTS

BACK REST - DOWELS

• Nut & Bolts can be bought in just in time to maximise production planning



BACK LEG - NUT & BOLT



TABLETOP - CORNER HALVING JOINT (strengthened with Camlock screws)

ARM REST - MORTISE &



MATERIALS

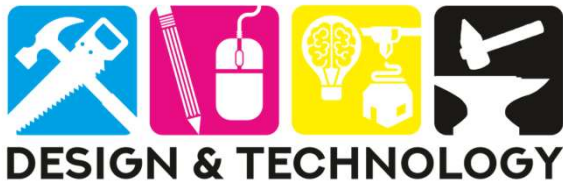
- Metal casing - Aluminium
- Doesn't rust
- Lightweight so it won't add much more unnecessary weight
- Compliments the wood aesthetically
- Easily worked and can be thinned.

- Wooden legs of table, chairs and arm rest - Eucalyptus
- Cheaper, since it won't be seen as much.
- Makes a nice contrast with the teal.

- Table top and chair seat and back - Teak
- Self protected
- High quality
- Weathers to a grey colour which contrasts the eucalyptus nicely.

Assignment pitfalls

- **Time management**
- **Exploration and refinement of ideas**
- **Ensuring a range of techniques used**
- **Covering all components of design when discussing materials and processes**



Question Paper

SECTION 1 — 25 marks
Attempt ALL questions

1. Two wheelchairs are shown with product information.



Collapsible manual wheelchair

Materials

ABS adjustable footrests
tubular mild steel frame and back wheels
nylon collapsible seat
aluminium front wheels

Additional details

assembled using standard components

Price – £79.99

Paralympic sports wheelchair

Materials

carbon fibre back wheels
stainless steel bumper and wings
tubular aluminium frame
nylon front wheels

Additional details

assembled using standard components
defensive wheelchair for elite level performance

Price – £4495.00



bumper and wings

1. (continued)

- (a) Explain why the materials chosen are suitable for these products.
(You must give six different explanations.)
- (b) Name **three** appropriate manufacturing processes used in the production of these wheelchairs and explain why each one is suitable.
- (c) Describe how function has influenced the design of these wheelchairs.
- (d) Explain the benefits and drawbacks for the manufacturer of using standard components during the production of these wheelchairs.
- (e) Describe how anthropometrics and physiology have influenced the design of these wheelchairs.

MARKS

6

6

5

4

4

2. The food packaging below was vacuum formed.



- (a) Explain why vacuum forming is a suitable process for the production of food packaging.

2

- (b) State the name of a suitable thermoplastic and explain why this thermoplastic is appropriate for the manufacture of food packaging.

3

The food packaging was manufactured using mass production systems.

- (c) Outline **two** considerations which would influence the selection of a production system.

2

3. Bose QC15 headphones are shown below.



The headphones were designed using CAD software.

- (a) Outline the benefits of using CAD software in the design of these headphones.

3

Bose has a strong brand image.

- (b) Explain the benefits of a strong brand image.

2

Bose has a patent which protects its Intellectual Property Rights (IPR).

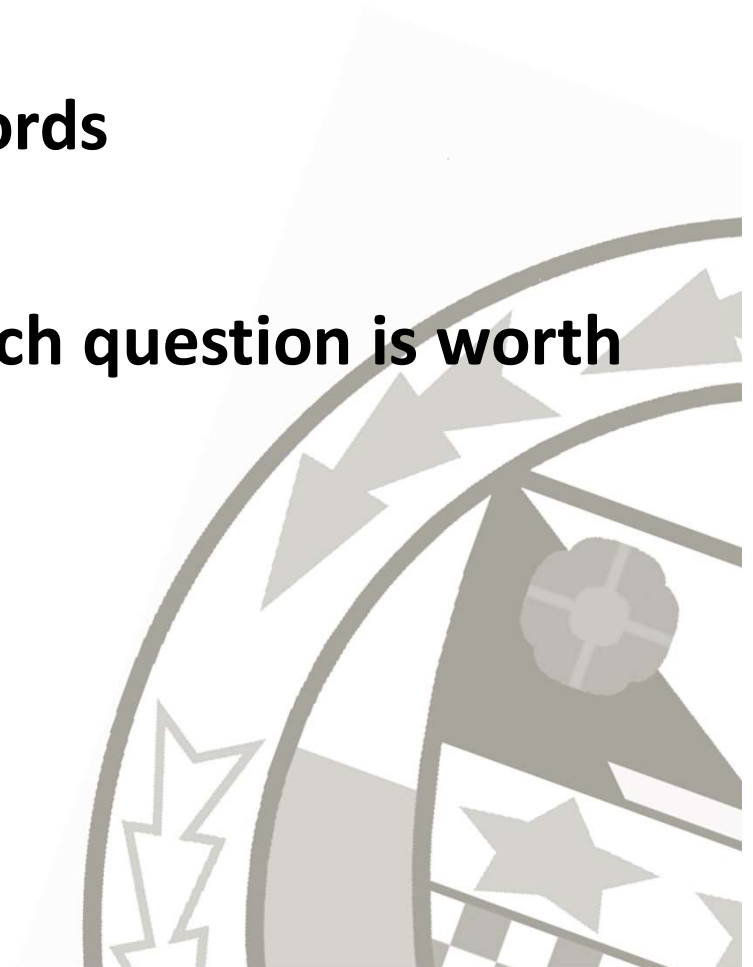
- (c) Identify another method of protecting IPR and give an example of what it would be used to protect.

2

Products such as the Bose headphones go through a product life cycle as shown in the graph below.

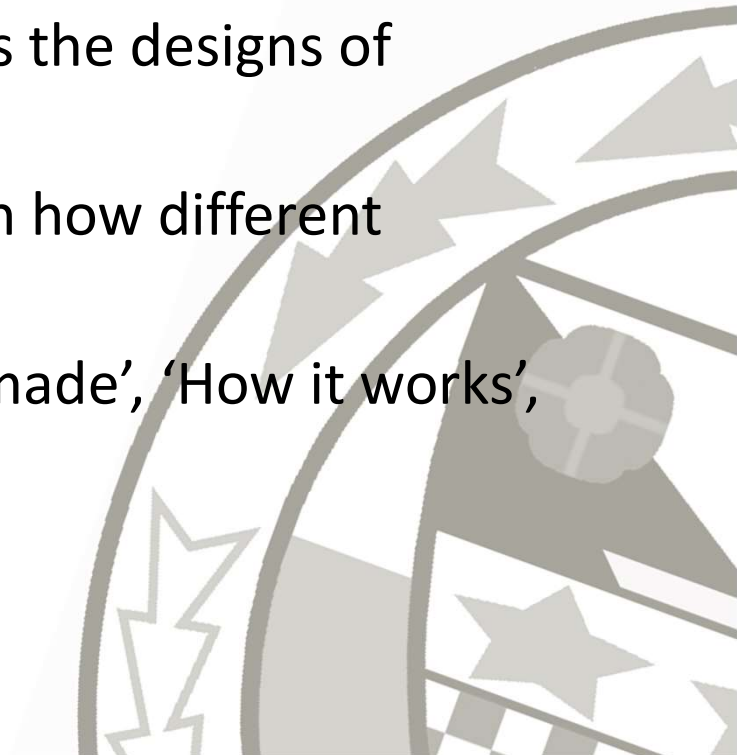
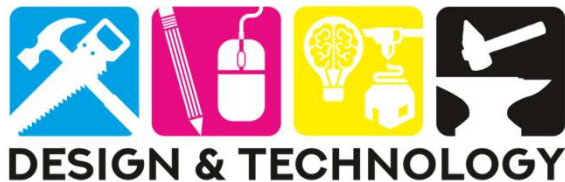
Question Paper pitfalls

- **Not writing enough detail**
- **Not taking note of command words**
- **Not taking note of the marks each question is worth**



Preparation and support

- Encourage supported study or lunch time drop in
- Communication - Ask if there is homework due, ask how their folio work is coming on, ask if they have been meeting their course deadlines.
- Allow pupils the opportunity to discuss the designs of products
- Allow pupils the opportunity to explain how different products were manufactured
- Watch programmes such as 'How it's made', 'How it works', 'Grand Designs', 'The Apprentice'.....



Resources

SQA Website -

<http://www.sqa.org.uk/sqa/47927.html>

Leckie and Leckie course notes

Social media

