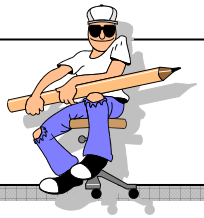
GCSE

Product Design Revision



The following pages are a guide to the key areas you will need to have knowledge of in order to successfully complete your GCSE exam. At the end of each of the four sections, test yourself with the example exam questions. The four main sections are:

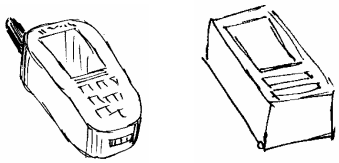
Designing & Making Skills, Materials & Components, Design & Marketing, Processes & Manufacture.

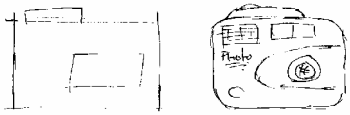
Designing and Making Skills

What do designers do? – They communicate their ideas through DRAWINGS which include NOTES and ANNOTATIONS to explain details. They can also used PROTOTYPE techniques or MOCK-UPS to show their ideas in 3D.

BASIC SKETCHING TECHNIQUES

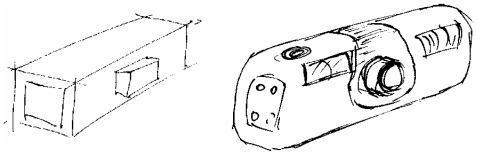
FREEHAND SKETCHING is very quick and easy. When asked to do a *SKETCH*, don't spend loads of time 'drawing', you must sketch and not worry about odd lines and accuracy. Do not rub anything out.





2D SKETCHING – similar to freehand but only uses one view and normally constructed using vertical and horizontal lines.

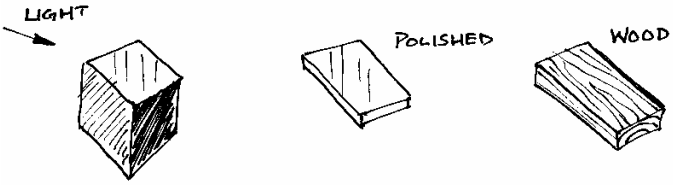
3D SKETCHING using *CRATING*. This is where you draw a box (crate) then gradually add bits on

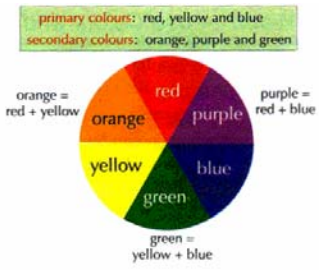


DEVELOP WITH SKETCHES – Show how an idea can gradually develop using quick sketches and add annotations to further enhance your ideas.

SHADING, SURFACES & TEXTURES, COLOUR AND MOOD

Pencils can be used to *SHADE* and to add *COLOUR.* This allows you to add shape to a 2D image and give an indication of the texture e.g. Glass, Wood etc. *(RENDERING)*

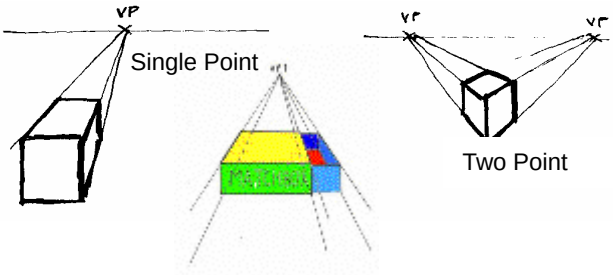




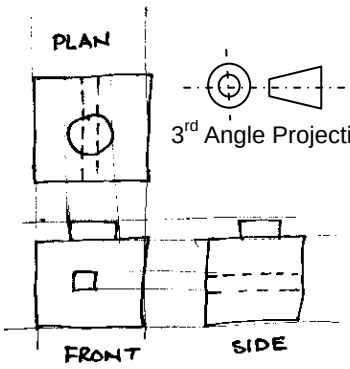
COLOUR can add mood to your designs. There are TWO main types of colour *PRIMARY* and *SECONDARY*. The PRIMARY colours are: Red, Blue and Yellow. They can be mixed together to make any colour.
SECONDARY colours are those produced by mixing together the PRIMARY colours.

PERSPECTIVE

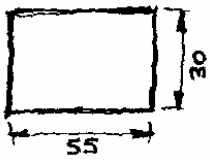
For 3D drawings. All the horizontal lines join a single vanishing point *(SINGLE POINT)*. If more than two surfaces of an object need to be shown *TWO POINT PERSPECTIVE* is used.



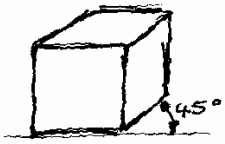
WORKING DRAWINGS (ORTHOGRAPHIC)
(2D views) 3rd ANGLE PROJECTION – 2D views of a 3D object showing a plan view, side view and front view. Som drawing may show the bottom and more than one side to show more detail. Draw to a *SCALE* and very accurately showing *DIMESIONS*

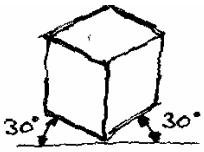


3rd Angle Projection



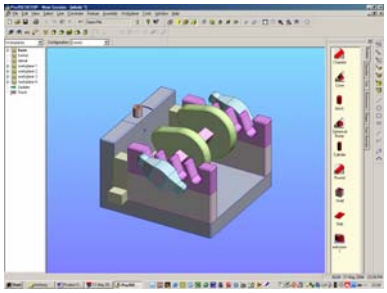
Dimensioning – showing the sizes

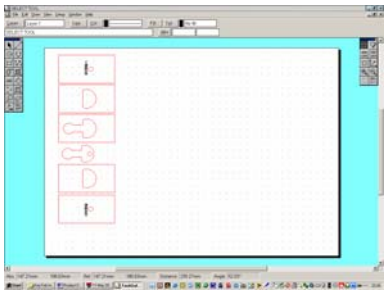




OBLIQUE & ISOMETRIC DRAWING – 3D working drawings that give a good all round idea of the shape of the product. *OBLIQUE* shows the front a, top and one side set at 45 degrees to the horizontal. *ISOMETRIC* shows two sides and the top (or bottom) each side being 30 degrees from the horizontal.

CAD (Computer Aided Design)
'2D Design' and 'ProDesktop' are very good examples of *CAD* programs. *ADVANTAGES* of *CAD* - They allow the designer to compare and try out ideas cheaply so that problems can be ironed out before manufacture. Designs can be viewed from all angles to see what the product would look like. Images can easily be changed to suit customer needs. *DISADVANTAGES* – Programs can be expensive and liable to viruses or loss of data.

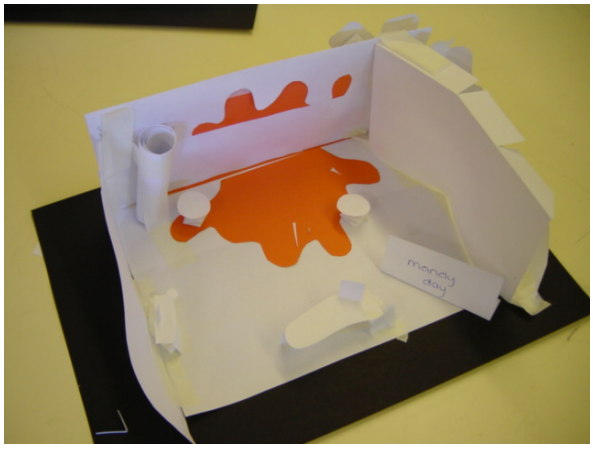




CAM (Computer Aided Manufacture)
CAM is the process where data from a *CAD* package is used to manufacture a product. *ADVANTAGES* – Products can easily be modified is necessary. Repeat jobs done quickly. Saves Labour and time. *DISADVANTAGES* – Programs can be expensive and liable to viruses or loss of data.

CNC (Computer Numerically Controlled)
This is haw the CAM machines are controlled. *ADVANTAGES* – Less cost because you don't need separate machines for multiple processes. Less chance of human error. Easily and quickly changed product. *DISADVANTAGES – High initial cost. High trainingn cost.*

SKETCH MODELLING
Normally used during the *DEVELOPMENT* stage of designing a new product. This could be anything from a vacuum cleaner to a new building. It allows the designer to try out ideas.
You can use many types of material – paper, card, wood, plastic, metal etc.**Designing and Making Skills**
Basic sketching techniques
Shading, Surfaces & Textures, Colour and Mood
Perspective
Working Drawings (Orthographic)
CAD (Computer Aided Design)
CAM (Computer Aided Manufacture)
Sketch Modelling



EXAMINERS NOTE:
During the exam you will find that you will be required to SKETCH, DRAW, ANNOTATE, DIMENSION and SHADE. You may also be asked questions about some of the above.

TIP:
Make sure that you have your own PENCILS (H or 2H are ideal as HB or B are messy). You will need COLOURED PENCILS, RUBBER, RULER, PENCIL SHARPENER and a PEN

Designing and Making Skills – Example Exam Questions

At least ONE of the exam questions will probably similar to this:

1. From the colour picture sheet, choose ONE product and use notes and sketches to show initial ideas for its packaging. (You can use this picture of a wooden picture frame).

The question may be in two parts:

(a) Show Initial Ideas for the package.

Marks will be awarded for:
Quality of Idea (3 marks)
Quality of notes (4 marks)
Quality of sketches (3 marks)

(b) Draw a SURFACE DEVELOPMENT of the package (NET). Certain information needs to be shown on the packaging,

Quality of Idea (7 marks)
Quality of notes (4 marks)

EXAMINERS NOTE:
Initial ideas – show several views (3D sketching and Orthographic drawing). Looking for a good understanding of NETS and packaging. Don't forget to show tabs and folds etc.

TIP:
Keep work neat and tidy. Avoid smudges and keep work simple.

Designing and Making Skills – Example Exam Questions (cont'd)

2. Computer aided design (CAD) and Computer aided manufacture (CAM) are now commonly used in the production of packaging.

   (a) Name **three** processes that can be completed more easily during the design stage of packaging production, using CAD.

(1. _____

(2. _____

(3. _____

   (b) Give **two** examples with reasons, to explain how CAM is used in the production of packaging.

(1. _____

(2. _____

3. What is the symbol for THIRD ANGLE PROJECTION?

4. What are SECONDARY colours?

5. What do the abbreviations CAD, CAM and CNC mean?

6. Explain THREE advantages of CAD.

7. Give THREE disadvantages of using CAM.

8. What type of computer programs are ProDesktop and "D Design?

9. What is meant by the term 'PROTOTYPE'?

10. Explain how photographs can be used in the design process.

Design & Marketing

DESIGN IDEAS
Why do we design?
MARKET PULL, also known as CONSUMER DEMAND. The customer wants products that satisfy their needs. This is known as WANTS and NEEDS. Manufacturer therefore make products to satisfy needs.
TECHNOLOGY PUSH, This is where research and development leads to a new product using newly developed materials , technologies and techniques. This could help to make a product cheaper.
DESIGN IDEAS, can come from a number of inspirational areas such as nature, buildings, etc. Inspiration is sought for *STRUCTURES, FUNCTION, AESTHETICS.*

PRODUCT ANALYSIS
Analysing existing products wil give the designer ideas for their designs. Looking at an existing products:
FUNCTION – what its used for.
FORM – Shape and look.
ERGONOMICS – How well the product is to use for us – is it safe and comfortable?
COST – Value for maoney, How much does it cost to make and buy?
COMPETITION – How well it performs and it cost compared to a competitors product.
ENVIRONMENT – Is the product and the processes used environmentally friendly.
MATERIALS – What is it made of and how the materials were formed and shaped.
MANUFACTURE – What were the processes used to make the product. Were sub-assemblies used? Was it manufactured as a *'ONE-OFF', 'BATCH'* or *'MASS PRODUCED'* item?
DEVELOPMENT – This is what the manufacturere could do to improve the product.

SOCIAL RESPONSIBILITY
When manufacturing and developing products, designers and manufacturers should be aware of the impact their product may have on the environment. Designers and Manufacturers must be environmentally responsible so that the materials will not harm the people using it.
Is it *TOXIC*
Produces a lot of *WASTE*
Can *RECYCLED* materials be used?
Are the working conditions for workers *SAFE* and *FAIR*?
Will any *SOCIAL*, *RELIGIOUS* or *CULTURAL* group be offended?

THE ENVIRONMENT
The materials used could affect the environment.
Rainforest are under threat as this is the main source of HARDWOODS.
Metals are limited and should be reused.
Most plastics come from OIL which will eventually run out.
We must recycle more and producers should be encouraged to use more recycled materials.

When we throw away our rubbish, land fill sites are used where chemicals can leach into the soil and affect the local environment.
Packaging is a large contributor to the environmental problem of rubbish disposal and should be reduced.

WHY PEOPLE BUY PRODUCTS
Most people will buy new products for one or more of the following: They like the design because it looks good or does its job well. It may be well constructed and have a good feel about it.
Reasons for choosing a product:
COST – value for money.
BRAND LOYALTY – Customer loyal to brand (e.g. NIKE).
AESTHETIC APPEAL – It looks really good.
FASHION – Trendy and up to date or 'STATE OF THE ART'.

CONSUMERS
As a consumer of products you are protected by many organizations. Customer satisfaction is important and can only be achieved if the manufacturer has ensured that their *QUALITY CONTROL* and *QUALITY ASSURANCE* procedures have worked.
CUSTOMER PROTECTION:
THE SALE OF GOODS ACT – Ensures that the goods you buy are suitable for selling.
THE CONSUMER SAFETY ACT – Legislates over safety of furniture,Toys etc.
THE TRADE DESCRIPTIONS ACT – If the manufacture says it will 'Last ten years' this ensures that the manufacturers claim must be true.
BSI (BRITISH STANDARDS INSTITUE) The famous KITEMARK will be displayed letting the consumer know that the product has been tested to certain standards.

DESIGN CONSIDERATIONS
TRADEMARKS & PATENTS: Once a designer has finished their design, they will probably register their designs with the *PATENT OFFICE*. This will ensure that no-one else will able to steal their idea, call it their own and profit from it. The *TRADEMARKS* used by companies are generally distinctive and they will not want others to copy their design and trade from their successes.

PRODUCTION: When planning for manufacture, the quantity to be made and the time needed will be governed by the cost. If the product is to be *MASS-PRODUCED*, it is important that they can be made as quickly as possible.

EASY TO MAINTAIN: Products should be designed so that they are easy to maintain and remain safe.

LABELS
HEALTH & SAFETY
CHOOSING BEST MATERIALS TO USE

Materials & Components

PAPER & BOARD

WOODS
MANUFACTURED BOARDS
METALS
PLASTICS
MECHANISMS

Processes and Manufacture
Hand tools
Machine tools
Jigs, Moulds and Templates
Deforming
Reforming
Fabricating (Screws, Nuts, Bolts, Nails, Rivets, Adhesives)
Joints
Finishing
Packaging and Waste
Scale of Production
Manufacturing Systems
Control Systems and Feedback
Quality Control and Assurance

The Exam
- Read questions carefullly
- If the question does not require colour, don't use colour.
- Make sure you understand the difference between 2D & 3D drawings – understand when to use which!
- Don't answer questions with just one word – explain your answers

GET THE BOOK –

The Essentials of AQA Design and Technology: Product Design
Lonsdale School Revision Guides (ISBN 1-903068-81-9) £4.50

The revision guide is valuable and is designed to cover ALL areas of the AQA Product Design course including: design skills, materials, techniques and production processes.

'What is Product Design?' and 'Why do designers design?' Questions you need to have the answers to.

You should also have an understanding of the following key technical words - Learn three or four a day: