<table>
<thead>
<tr>
<th>Revision Timetable (Lessons)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>30 Minute Time Slots</strong></td>
</tr>
<tr>
<td><strong>Exam Prep – Section A</strong></td>
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<tr>
<td>Answering the design part of the exam paper.</td>
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<tr>
<td><strong>The Design Process</strong></td>
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<td><strong>Materials and Components</strong></td>
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<td><strong>Graphical Techniques</strong></td>
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<td><strong>Society and the environment</strong></td>
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<td><strong>Exam Technique – Section B</strong></td>
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<td>How to pick up easy marks in the exam.</td>
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<td><strong>Practice Questions</strong></td>
</tr>
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<table>
<thead>
<tr>
<th>13th April Week 1</th>
<th>20th April Week 2</th>
<th>27th April Week 3</th>
<th>4th May Week 4</th>
<th>11th May Week 5</th>
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<tr>
<td>1</td>
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</tr>
<tr>
<td>• Logo/brand identity.</td>
<td>• Product Lifecycle.</td>
<td>• Paper and Boards.</td>
<td>• Sketching Techniques.</td>
<td>• Nets and Packaging.</td>
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<td>• Managing time – Quick sketching techniques.</td>
<td>• Section A (Paper 1)</td>
</tr>
<tr>
<td>• Slogan.</td>
<td>• Product Analysis.</td>
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<td>• Scales of Production.</td>
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<td>• Section B (Paper 2)</td>
</tr>
<tr>
<td>• Product Analysis.</td>
<td>• Laminating and Tubing.</td>
<td>• Tools and Equipment.</td>
<td>• Pictorial and working drawings.</td>
<td>• Scales of Production.</td>
<td>• Industry Processes.</td>
<td>• Social Responsibility.</td>
<td>• Evaluating ideas in detail.</td>
</tr>
<tr>
<td>• Ideas for self assembly decorations for an event</td>
<td>• Laminating and Tubing.</td>
<td>• Tools and Equipment.</td>
<td>• Pictorial and working drawings.</td>
<td>• Scales of Production.</td>
<td>• Industry Processes.</td>
<td>• Social Responsibility.</td>
<td>• Evaluating ideas in detail.</td>
</tr>
<tr>
<td>• Name stands for an event</td>
<td>• Tools and Equipment.</td>
<td>• Pictorial and working drawings.</td>
<td>• Scales of Production.</td>
<td>• Industry Processes.</td>
<td>• Social Responsibility.</td>
<td>• Evaluating ideas in detail.</td>
<td>• Evaluating ideas in detail.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Section B (Paper 1)</th>
<th>Section B (Paper 2)</th>
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<tbody>
<tr>
<td>• Section A (Paper 1)</td>
<td>• Section B (Paper 2)</td>
</tr>
<tr>
<td>• Section A (Paper 1)</td>
<td>• Section B (Paper 2)</td>
</tr>
</tbody>
</table>
Week 2: The Design Process

- Product Lifecycle
- Development & evaluation
- Product analysis
- Influential designers
1. **Introduction** – gap in the market launch of a new product. Expensive to begin with as you have to pay the designer and spend money on marketing.

2. **Growth** – if a product is successful sales will increase. Manufacture costs go down as you can mass produce them. Profits increase. Competitors introduce similar products.

3. **Maturity** – product is well known. Sales are high but there are more competitors. The product may have to be reduced in price. There are fewer new customers.

4. **Decline** – the sales fall, your profits shrink and eventually the product is replaced by a new one. Then it goes back to the beginning.

---

**Anthropometric Data**

To make your product the right size you must consider the body measurements of your user. Measurements of body parts are called anthropometric data. What products would need hand measurements? Height measurements? Head measurements?

**Ergonomics**

Making a product easy and comfortable for people to use. Lettering must be legible. Correct size font and clear. Products must be the right size for the intended user. If a product needs to be gripped the texture might be important. If the product needs to be moved or carried the weight needs to be kept to a minimum.

**Development and Evaluation**

**Product Analysis**

**Product Life Cycle**

**Models**

Can be 2D or 3D drawings done by hand or using CAD. Sketch-up shows a virtual 3D model from all angles. 3D models can be hand made and scaled down to check the shape of a design.

**Mock-Ups**

Are usually full scale and made of cheap material (card, paper or clay). You might make a mock up to quickly check a net or design will look right when made.

**Prototypes**

Mock-ups are called prototypes if they’re a full scale working product. They include working mechanisms and components, and they’re made using the right materials and construction methods. It may have limited features but will work for testing purposes.

**Influential Designers**

- **Jock Kinneir & Margaret Calvert**
  - Road signs – uses curvy letters that drivers can read easily. They also designed pictograms for warning signs.

- **Harry Beck**
  - Maps and systematic drawings.

  - The map only has straight lines, running vertically or horizontally or at 45°

  - The layout is simple and uses colours for each line. Other maps have been designed in this style.

- **Whalley Ollins**
  - Corporate identity
  - Designing logos and images that make a company recognisable.

- **Robert Sabuda**
  - Paper engineering – folding and cutting paper to create models that unfold and move. Known for making pop up books.

- **Alberto Alessi**
  - Product design – his idea was to produce simple products but keep them stylish and fun.

  - The designs are always distinctive and often colourful.

**Planned Obsolescence**

Advantages – drives innovation and keeps designers and manufacturers in jobs.

Disadvantages – consumers may get annoyed if products break. It is not good for the environment if you end up with loads of throw away products using resources, energy and pollution.

**Obsolescence**

1. Products can become out of date or break. The consumer has to replace the product. This is called obsolescence.

2. Designers sometimes deliberately design stuff so it becomes useless quickly. Such as make it poor quality, hard to repair, go out of fashion quickly. E.g. iPhone charger shape.

---

**Models**

**Mock-Ups**

**Prototypes**

**Influential Designers**

**Obsolescence**

**Planned Obsolescence**

**Anthropometric Data**

**Product Analysis**

**Product Life Cycle**

**Development and Evaluation**
(A product lifecycle is the life of a product from start to finish – or birth to death like in humans) Companies like Apple purposely give their products a short lifecycle so that consumers will have to buy the next upgraded model – this ensures the company is consistently making money. It also ensures that the consumer is happy because they are never bored with their product.

1) **Introduction** – Companies see a ‘gap in the market’ so they launch a new product. This is expensive to begin with as you have to pay the designer and spend money on marketing.

2) **Growth** – If a product is successful sales will increase. Manufacture costs go down as you can mass produce them. Profits increase. Competitors introduce similar products.

3) **Maturity** – Product is well known. Sales are high but there are more competitors. The product may have to be reduced in price. There are fewer new customers.

4) **Decline** – The sales fall, your profits shrink and eventually the product is replaced by a new one. Then the cycle goes back to the beginning.
When analysis a design you can use a method called ACCESS FM to ensure you remember to write about each area of the design. Make sure you use lots of adjectives and high level vocabulary!

**Product Analysis**

**ACCESS FM**

- **A:** Aesthetics, what does the product look like.
- **C:** Cost, how much does the product cost to buy?
- **C:** Customer, who would buy or use the product?
- **S:** Environment, where would the product be used or stored?
- **S:** Size, how big or small is the product?
- **F:** Safety, how safe during normal use?
- **M:** Function, how does the product work?
- **M:** Material, what is the product made of?

**Adjectives**

- Attractive
- Appealing
- Aesthetically-pleasing
- Beautiful
- Clear
- Colourful
- Cluttered
- Complex
- Distinctive
- Dull
- Detailed
- Elegant
- Effective
- Expensive
- Eye-catching
- Fancy
- Feminine
- Geometric
- High-end
- Inexpensive
- Luxurious
- Low-end
- Modern
- Masculine
- Old-fashioned
- Plain
- Professional
- Powerful
- Simple
- Symmetrical
- Silhouetted
- Traditional
- Unusual
- Unique
**Product Analysis**

**Ergonomics & Anthropometrics**

**ERGONOMICS**
Making a product easy and comfortable for people to use. Lettering must be legible - correct size font and clear.

Products must be the right size for the intended user. If a product needs to be gripped the texture might be important. If the product needs to be moved or carried the weight needs to be kept to a minimum.

**ANTHROPOMETRIC DATA**
To make your product the right size you must consider the body measurements of your user. Measurements of body parts are called anthropometric data.

What products would need hand measurements? Height measurements? Head measurements?
**Prototypes**
- Prototypes are working models of ideas for new products.
- Prototypes are used to test a final design.
- A good prototype is able to show potential users or clients how the proposed product will work and therefore get feedback to improve it before it is made.
- They are cheap but often use similar materials to the final product.
- Not a final product.

**Models**
- Representation of a real object.
- Presents a simplified version of something.
- Can be very simple or very complicated.
- Allows the designer to develop and improve an idea.
- Used in business to present an idea in detail.
- Uses cheap materials such as card, balsa wood etc.
**Design Evaluating**

Evaluating ideas in detail

**Success Criteria**

- Good sentence structure – Capital letters, punctuation.
- Connectives have been used to back up statements – for example: The design uses bright colours and modern designs, therefore, it appeals to the target market of young children.
- Correct Spellings and Technical language.

---

### Strengths

1. What are the strong parts of the design?
   - Aesthetics
   - Function
   - Target Market
   - Manufacture

### Weaknesses

2. What are the weak parts of the design?
   - Aesthetics
   - Function
   - Target Market
   - Manufacture

### Further Improvements

3. Which area could you focus on to make the design better?
   - Aesthetics
   - Function
   - Target Market
   - Manufacture

### Your Opinion

4. Do you like the design? Why?
   - Aesthetics
   - Function
   - Target Market
   - Manufacture

### Peer Feedback

5. What does your friend/client think about the design?
   - WWW – What Went Well
   - EBI – Even Better If
London Underground Map 1933

- Design is based on electrical wiring. Now used for other transport systems worldwide.
- The map isn't geographically correct – it shows which station comes next, but the layout is not accurate to real life.
- The map only has straight lines going vertical or horizontal. In reality = wiggly lines all over the place.
- Features of the map make it easy to use and it's been a huge success. Other transport networks now use Beck's style.

Influential Designers
Harry Beck
Influential Designers
Alberto Alessi

- He ran a kitchenware company, but **did not** create the designs for products himself!
- He employed designers to come up with creative and fun designs which were then manufactured by his company.
- A key part of his idea was to mass produce products while keeping the designs stylish and unique.
- A well known example is Philippe Starck's lemon squeezer.
Influential Designers
Jock Kinneir & Margaret Calvert

Road Signs
1957

- Were hired to design the new road signs needed when motorways were first opened in GB.
- The signs had a simple map showing the road layout ahead.
- For the font (Typeface) they developed a new font which used curvy letters that were easier for drivers to read.
- They also developed the colour scheme for different types of sign.
- The designs were successful because they were easy to read and understand!
Influential Designers
Robert Sabuda

- He is famous for developing a different style of paper engineering.
- Paper engineering means cutting paper to create models that unfolded and moved.
- He is well known for creating pop up books.

Paper Engineering
1990’s-Now
Influential Designers
Wally Ollins

Famous for designing many logos such as BT, Volkswagen and Lloyds.

London Olympics Logo 2012
Week 3: Materials and Components

- Paper & Boards
- Adhesives
- Plastics
- Laminating & Tubing
- Smart Materials
- Jigs & Moulds
- Tools & Equipment
**PAPER AND BOARDS**

- **PAPER – Below 200gsm (grams per square metre)**
  - CARTRIDGE PAPER – good for sketching and is textured.
  - LAYOUT PAPER – thin and translucent used for general design work.
  - BLEED PROOF PAPER – used when drawing with felt tips and markers and does not bleed.

- **BOARD – when it is more than 200gsm**
  - WHITE BOARD – high quality bleached surface. Used for packaging.
  - MOUNT BOARD – used to mount drawings and photos.
  - CORRUGATED BOARD – fluted inner core and two outer layers. Light weight and strong.

- **TRACING PAPER – translucent and is used to trace (copy) images. (more expensive than layout paper).**
  - DUXEL PAPER – different colour or material on each side. One surface smooth for printing.

- **GREY BOARD – rigid and easy to cover. Used for board games, book covers and ring binders.**

**ENVIRONMENTAL ISSUES:**
A lot of board is made from recycled paper. If the wood pulp comes from well managed forests it is fairly sustainable. Wood and board is bio degradable. White card uses bleach which can damage the environment.

**FILLERS AND FINISHES**

- **PLASTER FILLER** - powder mixed with water to make a paste. Applied to surface and left to dry. Can be sanded and painted to finish.
- **PAINTS** – made up of pigment and a vehicle. Vehicle evaporates and leaves the pigment on the surface.
- **VARNISH** – man made resin. The solvent evaporates to leave a transparent protective layer.

**ADHESIVES**

- **PVA**
- **Double sided tape**
- **Glue stick**
- **Making tape**
- **Glue gun**
- **Adhesive spray**

**ENVIRONMENTALLY MODERN MATERIALS**

- **PAPER FOAM** – Lightweight, impact resistant, waterproof, modelling objects with large flat surface.
- **EXPANDED POLYSTYRENE** – lightweight. Shape with a craft knife or hot wire cutter. Can be crumbly. Needs the surface filling before painting.
- **MACHINING FOAM** – more compact and less crumbly, can be painted.

**SMART AND MODERN MATERIALS**

- **PRECIOUS METAL CLAY**
  - Contains particles of metal (often silver) in a binding material. Often used to make jewellery.
  - The clay is easy to roll out and work with.
  - The clay is heated and metal fuses together to create a solid metal object. It can then be polished.

- **POLYMORPH** – modelling material that can be bought in pellets. When put in warm water goes soft and malleable. Can be moulded to shape and sets when cooled.

**THERMOPLASTICS**

- **PVC** – cheap, durable, different thicknesses, blister packs, insulation

- **POLYPROPYLENE (PP)** – strong, flexible, tough, lunch boxes, chairs, car parts

**THERMOSETS**

- **UREA FORMALDEHYDE** – good electrical insulator, resists chemicals, hard – printed circuit boards, plugs, kettles, surface coatings, table tops.

**PLASTICS**

- **PET (PETE)**
- **HOPE (HOPE)**
- **LOPE (LOPE)**
- **PP (PP)**
- **OTHER**

**THERMOPLASTICS**

- **ACETATE** – flexible, transparent, thin, can print on
- **HIPS** – high impact polystyrene, rigid, variety of colours, vacuum forming

**ENVIRONMENTAL MODERN MATERIALS**

- **FIBREBOARD**
- **CORRUGATED PLASTIC SHEET** – lightweight, impact resistant, strong, different colour or material on each side.
- **PAPER AND BOARDS**
- **ACETATE** – thin, crystal clear, flexible, tough, different sizes, can be paint on

**FILLS AND FINISHES**

- **PLASTER FILLER** – powder mixed with water to make a paste. Applied to surface and left to dry. Can be sanded and painted to finish.
- **PAINTS** – made up of pigment and a vehicle. Vehicle evaporates and leaves the pigment on the surface.
- **VARNISH** – man made resin. The solvent evaporates to leave a transparent protective layer.

**COMPOSITES MATERIALS**

- **ALUMINIUM** – tetra packaging is made from aluminum, card and polystyrene. This keeps flavours in and air out. E.g. drink carton.
- **POLYTHENE** – paper can be coated with polythene to make it waterproof. E.g. paper cups.
- **POLYSTYRENE** – foam core board is made by laminating polystyrene between card.

**ENVIRONMENTAL MODERN MATERIALS**

- **CORNSTARCH** – made from maize. Can be made in clear, flexible form for sandwich packaging.
- **POTATOPAK** – made from potato starch baked inside moulds. Fairly rigid, makes food packaging.
- **PAPER FOAM** – potato starch and paper fibers. Can make phone, DVD and CD packaging.
**PAPER CAN BE PROTECTED BY ENCAPSULATION**

1. Encapsulation is done using a laminating machine.
2. The paper is enclosed in a plastic pocket.
3. The sandwich is then inserted into the laminating machine. The machine heats the plastic and seals the paper.

Encapsulation (laminating) can be used to make a product stronger, waterproof and look more professional. However it is expensive and not environmentally friendly.

**PLASTICS**

**USES:** Used for bending plastic in a straight line. Signs

**BENDING WITH STRIP HEATER**

Thermoplastics cannot be bent when cold. They are bent using a strip heater or line bender which will heat the plastic in a straight line, so it can be bent by hand.

**INJECTION MOULDING**

A metal mould is used and softened or molten plastic is forced into the mould by pressure from a screw thread. The mould is made in two parts to allow the moulding to be removed.

**USES:** Complex plastic shapes. Children’s toys, school chairs, trays, containers.

**BLOW MOULDING**

A tube of softened plastic called a parison is extruded into a mould.

1. Parison inserted into mould.
2. Base of parison squeezed by mould.
3. Air blown in to parison, parison expands to fill mould.
4. Finished product.

**USES:** Plastic bottles/buckets and other similar hollow shapes.

**VACUUM FORMING**

1. Plastic placed over mould.
2. Plastic heated.
3. Air in mould removed by vacuum

**USES:** Hollow food packaging, planters, trays, bathtubs, shop fittings.

**JIGS AND MOULDS**

**JIG** - used to make sure that parts are made exactly the same, without the need for marking out. For example, when drilling through a block of wood with two holes in, it will make sure that the holes are drilled in the same place in each component.

**TEMPLATE** - something that you can draw around to mark a shape onto material.

**MOULD** - a hollow shape used when casting metal or plastic resin. Moulds for casting metal can be made in a special type of sand, in metal or in plaster. Moulds for casting resin can be made of plaster or rubber.
Types of Materials
Papers and Boards

Types of paper and their uses

<table>
<thead>
<tr>
<th>Type</th>
<th>Description and uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Layout paper</td>
<td>lightweight, thin white paper, used for initial ideas, takes colour media well, low cost</td>
</tr>
<tr>
<td>Tracing paper</td>
<td>thin, translucent paper, making copies of drawings, high cost</td>
</tr>
<tr>
<td>Cartridge paper</td>
<td>good quality white paper, available in different weights, general purpose work, can be used to make simple models, medium cost</td>
</tr>
<tr>
<td>Bleedproof paper</td>
<td>smooth, hard paper, used with water-based and spirit-based felt-tip pens, medium cost</td>
</tr>
<tr>
<td>Coloured paper</td>
<td>many different types, available in different thicknesses, used for mounting finished work, used to apply coloured surfaces to models, low to medium cost</td>
</tr>
<tr>
<td>Grid paper</td>
<td>printed square and isometric grids in different sizes, a guide for quick sketches and model-making, low cost</td>
</tr>
</tbody>
</table>

Types of board and their uses

<table>
<thead>
<tr>
<th>Type</th>
<th>Description and uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Board</td>
<td>range of thicknesses (from 300 microns to 650 microns), range of colours including solid white board, grey board and metallic, used for model, different applications use different thicknesses</td>
</tr>
<tr>
<td>Corrugated card</td>
<td>strong and lightweight, used for packaging protection and point of sale stands, available in different thicknesses</td>
</tr>
<tr>
<td>Mounting board</td>
<td>good quality thick card, coloured surface, used for final models, used for mounting work</td>
</tr>
<tr>
<td>Spiral wound tubing</td>
<td>high strength, 3D printable surface, used for packaging</td>
</tr>
<tr>
<td>Duplex</td>
<td>large foam-based board, different finishes available including metallic and holographic, used for food packaging, e.g. take-away pizza boxes</td>
</tr>
</tbody>
</table>

Paper sizes
Paper is available in sizes from A0 (biggest) to A6 (smallest). The most common size is A4. Each size is half the one before, e.g. A4 is half the size of A3.

Main Advantages of Paper and Board

- Flexible
- Cheap to purchase
- Sustainable & Recyclable
Types of Materials
Adhesives & Fastenings

Adhesives
An adhesive is a substance that bonds surfaces together.

<table>
<thead>
<tr>
<th>Adhesive product</th>
<th>Description</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polyvinyl acetate [PVA]</td>
<td>General-purpose glue</td>
<td>Wood, paper, card, foam board and foam blocks</td>
</tr>
<tr>
<td>Epoxy resin</td>
<td>Two-part glue that has to be mixed together</td>
<td>Joining different materials</td>
</tr>
<tr>
<td>Spray adhesives</td>
<td>Adhesive in an aerosol can</td>
<td>Large areas of paper and card</td>
</tr>
<tr>
<td>Solvent cements</td>
<td>Stiff liquid in tubes or cans, or a thin water-like liquid</td>
<td>Joining plastics, especially polystyrene</td>
</tr>
<tr>
<td>Hot-melt glues</td>
<td>Adhesive sticks or pellets for use in a glue gun</td>
<td>Joining different materials</td>
</tr>
<tr>
<td>Glue sticks</td>
<td>Solid stick of PVA-based adhesive in a tube</td>
<td>General purpose</td>
</tr>
<tr>
<td>Adhesive tape (clear)</td>
<td>Single or double-sided tape on a roll</td>
<td>Paper, card, lightweight materials</td>
</tr>
<tr>
<td>Masking tape</td>
<td>Paper-based low-tack tape on a roll</td>
<td>Temporary fixing</td>
</tr>
<tr>
<td>Low-tack film</td>
<td>Adhesive film</td>
<td>Masks for spraying and airbrush work</td>
</tr>
</tbody>
</table>

Fastenings
Fastenings attach two things together. They can be permanent or temporary.

- **Drawing pins** fix paper and card to wooden backing or hold model parts together while working on or painting them.
- **Mapping pins** are used to locate information on a chart.
- **Dressmakers' pins** are used to fix work on display boards.
- **Paper fasteners** fix moving parts in pop-up models and books. Use with brass eyelets for more robust work.
- **Paper clips** can be bent into small hooks for models.
- **Rubber bands** and **elastic** are used in pop-up models and crashlock models.
# Types of Materials

## Plastics

<table>
<thead>
<tr>
<th>Thermo-Plastic</th>
<th>uses</th>
<th>Principal uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>(ABS)</td>
<td></td>
<td>Toys, Telephones,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Signs, covers for car lights, wash basins and baths</td>
</tr>
<tr>
<td>(Acrylic)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Polystyrene (High impact) HIPS</td>
<td></td>
<td>Food trays, containers, lids, plates, trays, model making</td>
</tr>
<tr>
<td>Polythene (Low density)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Polyvinyl chloride (uPVC)</td>
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<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Thermo-Set Plastics</th>
<th>Properties</th>
<th>Principal uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phenol formaldehyde</td>
<td></td>
<td>handles, connectors</td>
</tr>
<tr>
<td>Urea formaldehyde</td>
<td></td>
<td>Electrical fittings, and control knobs, adhesives</td>
</tr>
</tbody>
</table>
Smart materials react to changes in their environment, such as temperature, light, moisture or electricity.
Smart Materials
Types

- **THERMOCHROMIC**
  Changes with temperature

- **HYDROCHROMIC**
  Changes with moisture

- **PHOTOCHROMIC**
  Changes with light

- **ELECTROLUMINESCENT**
  Changes with electricity

- **PHOSPHORESCENT**
  Absorbs light and changes once it's dark
1) Thermochromic

Reacts to a change in temperature
Smart Materials

2) Photochromic

Reacts to a change in day light
Reacts to a change in **dark light** (after absorbing daylight)
Smart Materials
4) Hydrochromic

Reacts to a change in moisture
Polymorph is a special plastic, often used for modeling in technology, which stays hard and white at room temperature, but can be softened at 60 degrees Celsius. You can then easily mould it into shape using your hands, much like plasticine.

Polymorph is ideal for ergonomic designs, such as handles, torches and games consoles.

Polymorph can also be classed as a smart materials as it can return to its original form when heat is removed.
## Components

### Various Techniques

<table>
<thead>
<tr>
<th>Processes</th>
<th>Uses</th>
<th>Cost</th>
<th>Comment</th>
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</thead>
<tbody>
<tr>
<td>Varnishing: water-based; oil-based; ultraviolet</td>
<td>Protection and enhancement; book covers and packaging</td>
<td>Low</td>
<td>Easy process, but ink must be dry; Water-based ink needs special machine; Oil-based is cheapest; Ultraviolet very smooth, but ink must be completely dry</td>
</tr>
<tr>
<td>Laminating</td>
<td>Protection and enhancement; book covers, packaging and special print jobs</td>
<td>Expensive</td>
<td>Plastic film applied to the paper or card on one or both sides; Good for protecting products that are handled a lot</td>
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<tr>
<td>Embossing</td>
<td>Gives visual and tactile effect; business stationery, invitations and packaging</td>
<td>Expensive</td>
<td>Requires special press tools to be made; The shape is pressed into the paper or card using steel dies</td>
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<tr>
<td>Foil applications</td>
<td>Enhancement on special work; book covers and photograph albums</td>
<td>Expensive</td>
<td>The design (letters or an image) is stamped on the material through a metal foil; This forces the foil into the surface of the material</td>
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</table>
## Audio case study on kerboodle

Complete questions on page 75

<table>
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<td>photograph albums</td>
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</tbody>
</table>
Moulds

What is it? A hollow container used to give shape to hot liquid material when it cools and hardens.

Moulds can be made from a range of materials such as MDF.

Jigs

What is it? A manufactured piece that ensures that parts are made identically without the need for marking out.

For example: When drilling through a block of wood with two holes in, it will make sure that the holes are drilled in the same place in each component.
**Templates**

*What is it?* something that you can draw around to mark a shape onto material, so that it can be cut or shaped.

Fashion designers use cutting templates to create clothing that is identical.

![Template image]

---

**Formers**

*What is it?* used to make sure that parts are shaped or bent to exactly the same shape.

![Former image]

ducer to make sure that parts are shaped or bent to exactly the same shape.
Week 4: Graphical Techniques

- Drawing Techniques
- Working Drawings
  - Colour
  - Lettering
**Drawing Techniques**

**CRATING**

Start by drawing a box ‘crate’ and gradually add bits. The object can then be drawn within the box. Details can be added by drawing more geometric shapes for guidance.

**THICK AND THIN LINE**

Thin lines show adjoining surfaces and thick lines are used when only one side can be seen.

Wood can be drawn using coloured pencils to represent the colour and grain.

Tone can be shown by using shading, patterns of lines, or dots.

Shades of grey can be used to show reflection to represent a metal effect.

**COLOUR FUSION AND SEPERATION**

**COLOUR SEPARATION** - Anything that is printed is made up of the 4 colours below. When you send a document to print the printer recognises the 4 colours to make the required image.

The screen is made from mesh and a stencil underneath. The material is put under the stencil. The dye is put on top of the mesh and a rubber squeegee is used to push dye through the mesh and the gaps in the stencil to make a pattern on the material.

**LETTERING**

Different lettering styles (fonts) are used for different purposes.

There are 2 main font styles, Serif (with a flick) and sans serif (without a flick). Other styles of lettering are Italic and **BOLD**.

Parts of lettering have different names as you can see in the image on the right.

**PICTORIAL AND WORKING DRAWINGS**

**ONE AND TWO POINT PERSPECTIVE**

Start by drawing the vanishing point then the front of the shape. Draw the construction lines.

Draw the front, vertical edge first then the construction lines to meet the vanishing points.

1) Draw the front view.
2) Add construction lines going up to draw the plan view.
3) Add construction lines to the right to draw the end view.

**EXPLODED**

Shows how a product fits together.

Draw the product with each separate part of it moved out as if it’s been exploded.

Dotted lines show where each part has been exploded from.

**SECTIONAL**

Show what the product would look like if you cut it in two (internal detail).

A front view shows where the cut has been made. The hatched lines show where the product has been cut.

**ISOMETRIC**

- Vertical edges are drawn as vertical lines.
- Horizontal edges are drawn at 30°
- Parallel edges appear as parallel lines.

**SCALE / ENLARGEMENT**

To draw a big object on a small piece of paper you need to use scale.

1:2 means the drawing is half the size.
1:4 means the drawing is a quarter of the size.
2:1 means the drawing is double the size.
1:1 is full sized.

**ORTOGRAPHIC**

All dimensions in millimetres (mm)
Scale 1:1

**Anatomy of Typography**

- Vertical edges are drawn as vertical lines.
- Horizontal edges are drawn at 30°
- Parallel edges appear as parallel lines.
**Drawing Techniques**

**Lines & Shading**

**THICK AND THIN LINES**

Thin lines show adjoining surfaces and thick lines are used when only one side can be seen.

**Wood** can be drawn using coloured pencils to represent the colour and grain.

**Tone** can be shown by using shading, patterns of lines, or dots.

**Shades** of grey can be used to show reflection to represent a metal effect.

**CRATING**

Start by drawing a box ‘crate’ and gradually add bits. The object can then be drawn within the box. Details can be added by drawing more geometric shapes for guidance.
A design of a **3D shape on a 2D surface**.

Isometric projection uses vertical lines and lines drawn at 30° to horizontal.
Q: Why do we draw in isometric?

Answer: So that designs can be seen from different angles – good for showing measurements
ONE AND TWO POINT PERSPECTIVE

Start by drawing the vanishing point then the form of the shape. Draw the construction lines.

Draw the front, vertical edge first then the construction lines to meet the vanishing points.
Working Drawings
Orthographic & Exploded

ORTHOGRAPHIC

1) Draw the front view.

2) Add construction lines going up to draw the plan view.

3) Add construction lines to the right to draw the end view.

EXPLODED

Shows how a product fits together.

Draw the product with each separate part of it moved out as if it’s been exploded. Dotted lines show where each part has been exploded from.
**SCALE / ENLARGEMENT**

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**SECTIONAL**

Show what the product would look like if you cut it in two (internal detail).

A front view shows where the cut has been made. The hatched lines show where the product has been cut.
COLOUR FUSION AND SEPERATION

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The screen is made from mesh and a stencil underneath. The material is put under the stencil. The dye is put on top of the mesh and a rubber squeegee is used to push dye through the mesh and the gaps in the stencil to make a pattern on the material.

COLOUR MEANINGS & PROCESSES

**COLOURS**

- **PANTONE BLUE**: Authority, confidence, loyalty, success, security.
- **PANTONE TURQUOISE**: Health, cleanliness, calm, tranquility, trusting.
- **PANTONE GREEN**: Nature, healthy, fresh, money, environment, jealousy.
- **PANTONE YELLOW**: Happiness, warmth, caution, joy, playfulness, hunger.

- **PANTONE PURPLE**: Luxury, expensive, royal, mysterious, sophisticated.
- **PANTONE PINK**: Feminine, floral, romantic, innocent, delicate.
- **PANTONE RED**: Action, leadership, danger, drive, passion, strength.
- **PANTONE ORANGE**: Playful, affordable, creative, fun, youthful, energetic.

- **PANTONE BROWN**: Neutral, calm, depth, earth, roughness, serious, natural.
- **PANTONE GREY**: Authority, corporate, practical, respectful, stable, neutral.
- **PANTONE WHITE**: Peace, purity, cleanliness, simplicity, truthful, innocence.
- **PANTONE BLACK**: Bold, classic, sophisticated, authority, powerful, serious.
Lettering
Typographic Styles

**Bold**
Used to make words stand out.

**Serif**
Used on traditional pieces of text.

**Display**
Used on displayed items such as posters or signs.

**Italic**
Used to stress important words or quotes.

**Sans Serif**
Used on more modern pieces of text.

**Script**
Used on fancy designs to make them look luxury/expensive.
**Lettering**
**Typography Anatomy**

**LEADING**

**KERNING**

**TRACKING**

**Leading** = The **Vertical** Space between lines of type.

**Kerning** = Space between each letter in a word.

**Tracking** = Space between each word in a sentence.
6 (b) (iii) On the given letters shown below, label the parts indicated.

You should choose from the following terms and write your answers in the correct box.

| Serif | Stem | Curve | Continuous curve |

(4 marks)
Week 5: Packaging & Industry

(Product Lifecycle, development & evaluation, product analysis, influential designers)
ONE OFF PRODUCTION
Making one product – every item will be different. It is time consuming. Expensive. Labour intensive. Concerned with aesthetic appeal and detail. E.G painting, sculpture, made to measure furniture.

MASS
- Used to make thousands and thousands of identical products.
- Simple, repetitive tasks which are easy for people to learn.
- Uses on assembly line.
- Usually uses CAM and expensive speciality equipment.
- Costs a lot to set up but is much faster.
- Does not require highly skilled staff.
  E.g. Cars, televisions.

BATCH
- Making a specific quantity e.g. 10 or 2000.
- Batches can be repeated as many times as necessary.
- One process e.g. cutting out is completed on the whole batch. Then a second process and so on.
- Quicker than one off.
- Machinery and labour need to be flexible.
- Down time: time between batches when machinery may need to be changed or set up differently.
- Not as efficient as mass production as you may get parts at just the exact time that they are required in the factory.
  – parts waiting for a slow process e.g. paint drying.
- May need to be changed or set up differently.
- Advantages:
  – highly efficient.
  – makes complicated designs quickly.
- Disadvantages:
  – expensive as machinery is often specialist.
  – Not as efficient as mass production as you may get parts at just the exact time that they are required in the factory.

JUST IN TIME
- Just in time production means just that. This involves the arrival of parts at just the exact time that they are required in the factory.
- This means that less storage space is needed at the factory, so saving space at the factory.
- If the flow of parts is stopped or is late the line will stop and this production technique could then become very costly.

QUALITY ASSURANCE – what will you check?
Includes:
- Good staff training
- Procedures for checking quality of materials
- Systems for keeping machinery maintained
- Also includes quality control checks.
This is to ensure products:
- Conform to a specification
- Do a job they were designed to do
- Meet the standards e.g. British Standards
- Keep customer happy
- Are manufactured consistently

QUALITY CONTROL – how will you check it?
- Testing samples of components to see if they meet manufacturers specifications e.g. for colour, faults, size...
- Tolerance: When checking the size, components must be within a specific tolerance e.g. 0.5mm larger or smaller than the specified size.
- Prevents waste
- Once a problem is spotted it can be put right.

ONE PROCESS E.G. cutting out
- Uses an assembly line.
- Once a problem is spotted it can be put right.
- Advantages:
  – Very efficient.
  – uses an assembly line.
  – Once a problem is spotted it can be put right.
- Disadvantages:
  – What will you do if the computers get a virus or files are corrupted.

CAD/CAM (computer aided design/computer aided manufacture).
Examples of CAD: photoshop design or any other 2D drawing software and 3D modelling software
(google sketchup, Pro/D Targets)
Examples of CAM: CNC cutters, milling machines, laser cutter, vinyl cutter and a 3D printer.

ADVANTAGES: can easily make changes to designs, faster, more accurate, reduced labour costs, can leave to run through the night.

DISADVANTAGES: initial cost of software and hardware, expensive and lengthy training, work can be disrupted if the computers get a virus or files are corrupted.

NETS AND PACKAGING
VINYL CUTTER – an image from a computer can be printed but instead of ink a blade will cut out the shape either in card or vinyl (stickers).
DIE CUTTER – a die cutter presses out the net from a sheet of material using a sharp blade shaped to the outline of the net. Creases can be made by rounded creasing bars. Advantages/disadvantages – expensive as the mould is made from metal, great for making large quantities accurately.

NETS (SURFACE DEVELOPMENT)
Glue area
Glue tab
Fold line
Cut line
Dust flap
CAD can be used to design packaging. Advantages – more accurate, replicate easily, quicker, make complicated designs quickly.
In batch production lots of nets can be printed using tessellation to ensure minimal waste.

BAR CHART – equally spaced bars the same width. Drawn horizontal or vertical. Compare results in a visual way.
A Healthy Meal
PIE CHART – make sure the sections add up to 100%. Label each section and could add a key on the side.

PICTOGRAPH – charts made of pictures. Use symbols or simple pictures makes the graph look more interesting. Use a key.

FLOW CHARTS
A flow chart shows a number of events in the order they take place.
The feedback loops and decisions show you how to fix a problem if something isn’t right.

SEQUENTIAL ILLUSTRATIONS
Instead of a flow chart you can use a series of illustrations. For example flat pack furniture.
In school, you may make something by hand or use some CAD/CAM equipment such as this small laser cutter.

In industry, however, most things are scaled-up.

Industrial standard equipment is used and each process may be done by different people, with the product moving between them on a conveyor belt. This is called a production line.
One-off

A one-off product is made for a particular purpose or to be unique. Large sculptures or small hand-made products are both examples of this.

Batch production

Batch production is for products that may not be in demand all the time, such as this souvenir tea towel.

Batch production is also used for products where design is very important. High-end sports cars are produced in small numbers to stimulate demand and keep them exclusive.
The washing machine is mass produced. It is a functional product with some element of design to make it stand out and attract the buyer. There is competition from different manufacturers and tens, or possibly hundreds of thousands may be made.

The tablet containers are a continuously produced standard product. They are made as blanks for a number of different manufacturers to add their own designs or labels at a later stage. They are purely functional and produced in millions around the world.
This is a very simple concept. A company will only order enough raw materials or blank components for their exact needs at that time. There is nothing stored and taking up space in the warehouse, so money is saved in transport and storage costs.
The plans for any project must include what everyone should be doing to ensure the product is fit for purpose and is of the highest quality.

QA covers every aspect, from buying the best raw materials to training all the staff and working closely with the client to agree the standards.

Quality control measures are built into the QA plan. They are the tests and checks that are carried out during production. All these checks are recorded at every step so the QA manager has all the data.

Very accurate measuring equipment, such as Vernier gauges and digital micrometres, are used in industry.
Tolerance is the acceptable range of accuracy. The QA manager agrees the tolerances with the client and these are put in the plan.

+ or – 0.05mm

This means that this particular size can be no more than one twentieth of a millimetre bigger or smaller when it is measured.

+ or – 0.001mm

Tolerances in some industries, such as car engine manufacture, can be as low as one thousandth of a millimetre.

Visual checks are also part of QC. Ensuring the colour or finish of an object looks right is very important.
A net is a 2D plan for a 3D object. Nets are also called ‘surface developments’
When Drawing a Net...

- **Solid Lines** to show edges you are supposed to cut.
- **Dotted lines** to show edges which fold.

**Benefits of Nets**

- Great for *modelling ideas*.
- They produce a 3D model *quickly*.
- They are *cheap* to manufacture.
- Can be printed on easily as a 2D shape as it is *difficult to print on 3D shapes*. 
Nets
Industry Manufacture

CAD – 2D Design

• Nets in industry are designed using **CAD program 2D Design**. This is good because you can easily amend it until it is correct.

CAM - Die Cutter - Laser cutters – 3D printers

• Once the net is designed, it is pressed out using a **Die Cutter**.

• Using **CAM** is good because it is more **accurate** and **quicker** than doing it by hand.

http://technologystudent.com/rmprp07/glidr2.html
Packaging Functions

1) To Preserve the product. For example, food packaging is sealed to stop food from expiring quickly.

2) To Protect the product from damage using durable materials and a secure design.

3) To make the product more attractive to the consumer so that they purchase it.

4) To make it easier to transport the product. For example, some packaging is designed to stack.
Packaging Functions

1) Protection during transport

When products are transported they need to be protected to stop them getting broken – cardboard or polystyrene is strong enough to protect products from knocks.

2) Storage

Packaging is often stored in warehouses or on shop shelves. This means it has to be strong enough to hold the weight of one on top of the other. Well designed packaging fits neatly together – this will also save space!

3) Display

Packaging is displayed in shops for the customer to see. Designed to make it clear what the product is (transparent window) and entice people to buy it. Companies need to be creative to make their product stand out – bright colours and large logo.
4) Security

Packaging is also used for the **security** of the product it contains. Electrical equipment may contain **anti theft devices/ink**. Many food items have **tamper evident seals** to show whether they’ve been opened.

5) Product Information

Companies have to provide customers with certain **information** about their products – this is displayed on the packaging. Food products – **sell by dates, ingredients, allergy information**. **Symbols** – Mobius Loop, Tidy man, barcode.
CAD – Computer Aided Design
The designing of products on a computer

**Advantages**
- Ensures very high accuracy levels.
- Can e-mail designs.
- Can save designs for future reference.
- Can see what designs look like in more detail.

**Disadvantages**
- Expensive to set up.
- Can lose work if not saved properly.
- Staff need training.
- Need a computer.

Photoshop, 2D design, Google Sketchup, AutoCAD

CAM – Computer Aided Manufacture
The manufacture of products using machinery & computers

**Advantages**
- ✓ In large-scale production, the results are consistent (always the same).
- ✓ Ensures very high accuracy levels.
- ✓ Quicker production.
- ✓ Don’t need to employ a lot of staff (machine does the work).

**Disadvantages**
- X The software is expensive so initial costs are high.
- X Staff need to be trained how to use the software and machinery, which adds to costs.
- X Not everyone has a computer – additional costs.

Laser Cutters, 3D Printers, Die Cutters
Week 6: Society & Environment

(Product Lifecycle, development & evaluation, product analysis, influential designers)
**BRANDING AND SOCIAL RESPONSIBILITY**

**CORPORATE IDENTITY** – the image the company wants the consumer to have of the company. So consumers should know what the company is about and what it does.

**BRANDING** – memorable graphics are a good way to make sure consumers recognise your products. Many companies often apply their logo and colour scheme to all printed material. Strong branding means that consumers recognise the company from its logo alone without the need for words.

**MORAL RESPONSIBILITY** – companies want consumers to view their company as morally responsible. So they should consider the materials so it does not harm the environment, ensure the product would not harm the consumer or cause any harm during the manufacture of the product e.g. cause pollution or exploit workers.

**SOCIAL RESPONSIBILITY** – Designers need to be sensitive to the feelings of different groups in society. They need to make sure designers do not put off, insult or offend people for political, religious, gender or cultural reasons.

**THE 6 R'S**

- **REDUCE**
- **REUSE**
- **RECYCLE**
- **REPAIR**
- **RETHINK**
- **REFUSE**

**WORKING SAFELY**

**WEAR APPROPRIATE CLOTHING**
make sure sleeves are rolled back, tie and apron strings are tucked in. Tie long hair back. Protect yourself from hazardous substances by wearing gloves.

**HANDLE MATERIALS AND WASTE SENSIBLY**
Varnishes and glues can give off harmful fumes so work in a well ventilated area. Beware of hot heating elements and keep away from flammable substances. Dispose of waste properly. Store material safely so it does not injure anyone. Use a brush to clear away sawdust.

**RISK ASSESSMENT**

- The key to safe working is to do a written risk assessment. This outlines any hazards that might arise during the project.
- If it is not possible to remove the hazard, then the risk should be reduced by the use of protective equipment, such as guards on machines, extraction systems, or personal-protection equipment.
- If the hazard cannot be reduced to an acceptable safe level then the process should be stopped, and an alternative process should be found.

**TAKE CARE WITH TOOLS AND MACHINERY**

1) Always use a cutting mat and safety ruler when using craft knives.
2) Always secure work safely.
3) Know how to isolate and switch of machinery.
4) Never adjust machines unless you have switched it off.
5) Never leave machines unattended.
6) Don’t use machines or tools unless you have been shown how.
7) Carry tools safely.
Mobile phones and computers use Icons as shortcuts to the main software or file. Mobile phone app’s are also icons.

Icons should be **simple** and **clear** to read with a small selection of colours.
Pictograms are used on signage instead of text. This is because they can be understood in any language and are quick to read. They are simple and easily recognisable.
Trademark protects the design of a logo/brand/company name.

Expensive to register – designs have to be 2D.
Copyright protects written, theatrical, musical and artistic works as well as film, book layouts, sound recordings, and broadcasts.

Copyright is an **automatic right**, which means you don't have to apply/pay for it.
Patents protect the methods and processes that make things work. You have to apply for a ‘patent’ and they can be expensive.
**Task** – How would you protect these designs? In your book write the name of the image and then how it would be protected.
A design that **does not** cause permanent damage to the environment and **does not** use up **finite** resources.

**Sustainability Definition**

**How can a design be made sustainable?**

**Using the 6R’s**

- **RETHINK** - our current lifestyles and the way we design and make.
- **REFUSE** - to buy materials and products that are unsustainable.
- **REDUCE** - the amount of energy and materials used to manufacture a product.
- **REUSE** - the product for something else so you don't need to throw it away.
- **REPAIR** - the product so you don't need to throw it away.
- **RECYCLE** - finally take the product apart and categorise the parts ready for being converted into another product. This uses a lot of energy.
All raw materials are taken from the planet and waste products remain with us in some form:

• **Renewable materials** are grown from plants or animals.

• **Non-renewable materials** are taken from oil and minerals and can’t be replaced (they are finite).
Everyone involved in designing and making products has a responsibility to minimise risks to themselves or others. Any activity, substance or tool that could potentially cause harm is a **hazard**. There are different hazards during production, when the product is finished, and when it is being disposed of.

<table>
<thead>
<tr>
<th>Tool</th>
<th>Hazard</th>
<th>Risk control measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Craft knife</td>
<td>Cuts caused by incorrect and careless use</td>
<td>• hold the work correctly</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• use safety ruler</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• use a cutting mat</td>
</tr>
<tr>
<td>Paper drill</td>
<td>• cuts caused by incorrect and careless use</td>
<td>• use a cutting mat</td>
</tr>
<tr>
<td></td>
<td>• puncture wounds caused by broken drill bits</td>
<td>• check drill bits are not damaged</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• clean drill bits with caution</td>
</tr>
<tr>
<td>Scissors</td>
<td>Cuts caused by incorrect and careless use</td>
<td>• hold the work correctly</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• carry with the blade enclosed</td>
</tr>
<tr>
<td>Sanding disc</td>
<td>• flying debris</td>
<td>• wear safety goggles</td>
</tr>
<tr>
<td></td>
<td>• hands in contact with abrasive surface</td>
<td>• wear an apron and no loose clothing</td>
</tr>
<tr>
<td></td>
<td>• inhalation of dust</td>
<td>• use dust extraction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• hold the work firmly, but do not apply excessive pressure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• hold work flat on the bed of the sander</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• do not sand short pieces of material</td>
</tr>
<tr>
<td>Fretsaw</td>
<td>• flying debris</td>
<td>• wear safety goggles</td>
</tr>
<tr>
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<td></td>
<td></td>
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<th>Meaning</th>
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<td>Danger: high voltage</td>
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<td>Ear protection must be worn</td>
</tr>
<tr>
<td><img src="image" alt="Flammable" /></td>
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</tr>
</tbody>
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Useful Information
Revision Websites (You should be revising each topic at home as well as in lesson time!)

**BBC Bitesize Graphics**

**Technology Student Graphics**
Additional Help & Support (Exam Date: Tuesday 21st June 2016)

After School Revision Sessions

If you are still unsure about certain theory topics AFTER going through it in lesson time, additional revision sessions will be held after school with Miss Welsh/Mr Malone on the below dates @ 15:05-16:00

(Please let us know that you will be attending via email or in person, and what it is that you would like us to revise with you).

Wednesday 20th April – MME
Thursday 21st April – SWH
Wednesday 27th April – MME
Thursday 28th April – SWH
Wednesday 4th April – MME
Thursday 5th May – SWH
Wednesday 11th April – MME
Thursday 12th May – SWH
Wednesday 18th May – MME
Thursday 19th May – SWH

Teacher Emails:
Email your teacher if you are unsure about anything at all...

welshs@standishchs.wigan.sch.uk
malonem@standishchs.wigan.sch.uk

Graphics Twitter:
Reminders, Revision Material and Resources will be posted on the subject twitter:
@SCHSgraphics