

Year 11 Design and Technology NEA

Key information

All KS4 students will be following the AQA 9-1 GCSE Design & Technology Syllabus, course code 8552.

The exam board is AQA - The course is split into:

NEA - Non Examined Assessment -
50% of the qualification

Approximately 35 hrs of candidate work

Design & Make task from a contextual challenge set by AQA

Worth 100 raw marks

Internally assessed and externally moderated

Exam - 50% of the qualification

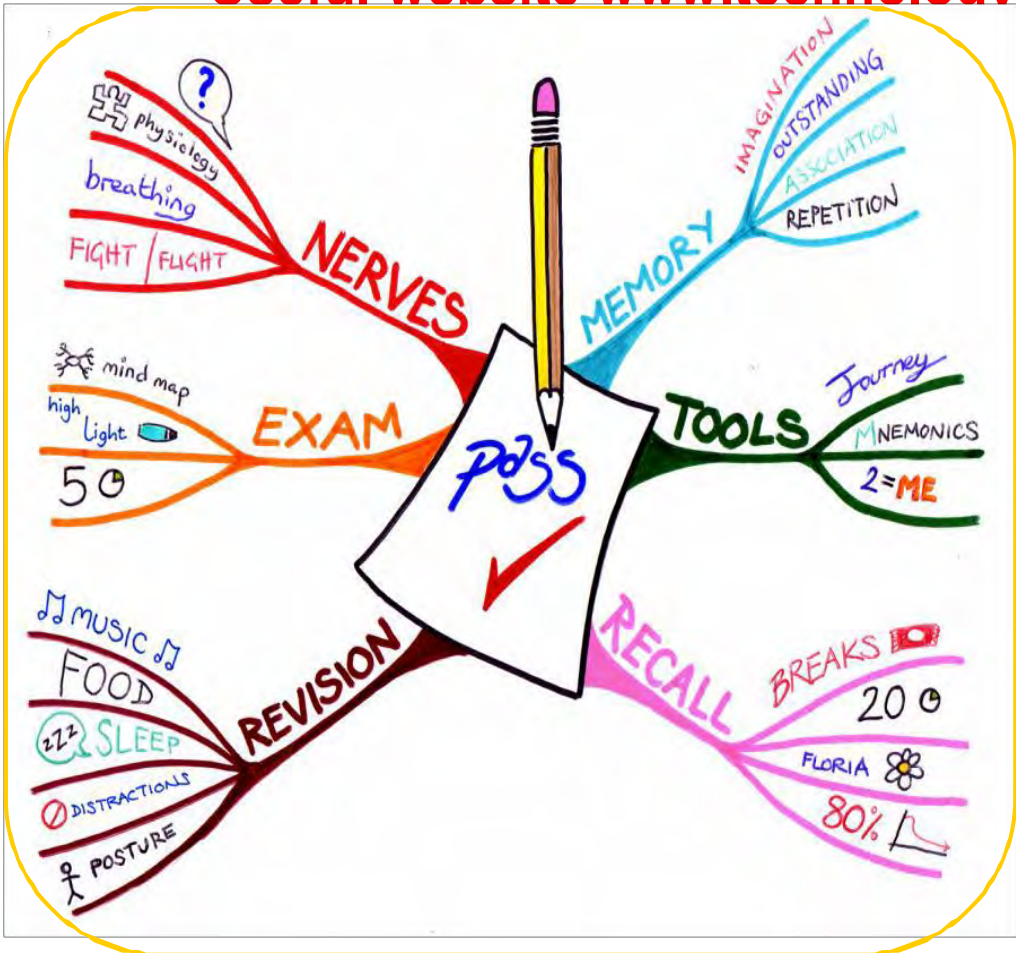
2 hour exam

Design technology exam set by AQA

Worth 100 raw marks

Externally moderated

positively mad—a reminder



How to Mind-Map

- Draw central image in the middle of a landscape page
- Create branches that radiate out from the central image
- On the branch, write/draw main headings. Heading, drawing and branch are the same size.
- Place a small dot at the end of the branch.
- From the dot, radiate lines for sub-headings.
- Place dot at end of line. Write or draw sub-heading on top if lines. Make sure words and pictures are the same length as the line.
- The lines do not have to be straight.
- At the end of lines, draw a dot.
- From the dot, radiate lines for supporting information.
- Wherever possible. Use pictures, symbols, colour codes.

Story links

- Break into little bits or lists.
- Turn the bits into images.
- Think of a weird story or song to link the bits, items or images together.
- Tell the story to yourself as you go along..
- Draw the story.
- Use the pictures to help you retell the story often.

Learning the order of the planets
example:

SUN, MERCURY, VENUS, EARTH, MARS,
JUPITER, SATURN, URANUS, NEPTUNE,
PLUTO:

I see the sun trapped in a thermometer (Mercury), held by a beautiful woman (Venus), standing in a pot of (Earth) while standing on a (Mars) bar. Her friend (Jupiter) gives her a T-shirt with the word SUN (Saturn, Uranus, Neptune) written on it. He said it once belonged to Walt Disney’s dog (Pluto).



Journey systems

- Think of a short journey from one place to another.
- Name or number up to 10 different locations along the way.
- Attach the things you need to remember to the locations you have created.
- Draw the journey with the attached information.
- To review, go over the journey several times in your mind and recall the facts you need to remember.

story links & the journey system



The BUG Technique



Use the BUG technique for answering questions in Product Design as follows:

Example Question 1 (a) *Explain how the designer has made use of specific materials in order to achieve the form and aesthetics of the coffee maker.*

Look carefully at the question.

1. First box (B) the word which gives the type of answer required.

Explain how the designer has made use of specific materials in order to achieve the form and aesthetics of the coffee maker.

2. Then underline (U) the key words needed for the answer

Explain how the designer has made use of specific materials in order to achieve the form and aesthetics of the coffee maker.

3. Finally glance (G) back to ensure that all necessary key words are included.
-

Example Answer

Describe the difference between a hardwood and a softwood. (2 marks)

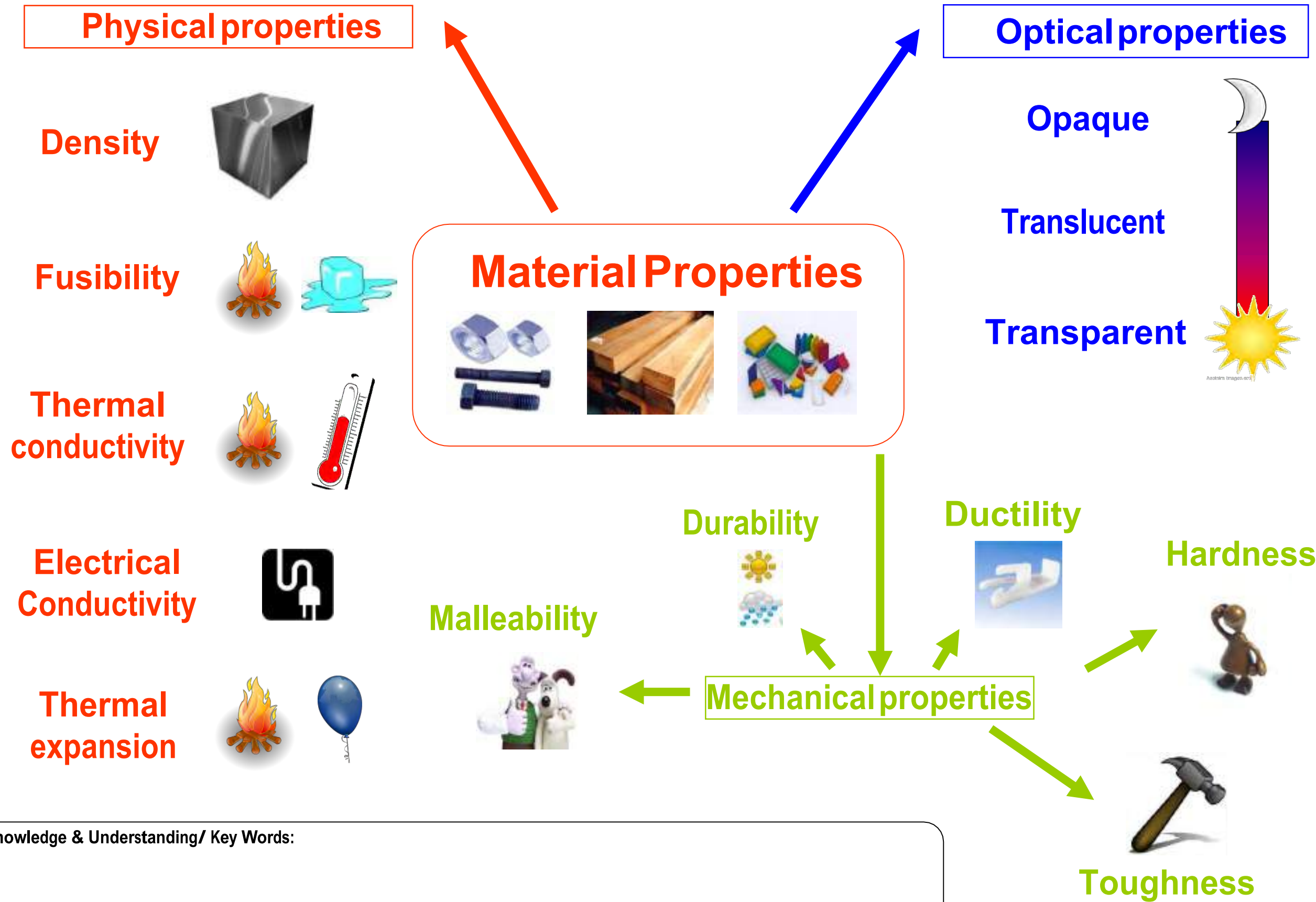
Top mark answer (2)

Hardwood comes from deciduous tree / trees that lose their leaves in the winter (1).

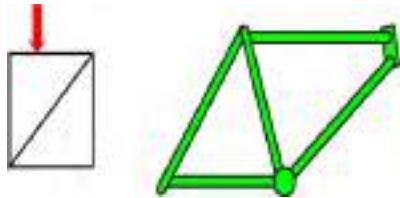
Softwood comes from coniferous trees/trees that keep their leaves in the winter (1).

Basic answer (1)

Hardwood is deciduous and softwood is coniferous



Structural systems



FRAME



SHELL



SLAB



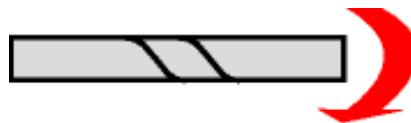
FLEXIBLE

GRAVITY

Forces acting upon them



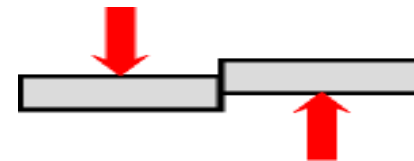
TENSION



TORSION



COMPRESSION



SHEAR



BENDING

Material Properties

	DENSITY	FUSIBILIT Y	THERMAL CONDUCTIVIT Y	ELECTRICAL CONDUCTIVIT Y	THERMAL EXPANSIO N	DUCTILITY	HARDNES S	TOUGHNESS	DURIBILT Y
HIGH	GOLD LEAD	TUNGSTEN CHROMIUM	COPPER ALUMINIUM	GOLD COPPER	POLYTHEN E NYLON	POLYPROPYLENE COPPER	DIAMOND CHROMIU M	POLYCARBONATE COPPER	GOLD TIN
	COPPER STEEL	COPPER STEEL	MILD STEEL TIN	STEEL ZINC	ALUMINIUM TIN	MILD STEEL BRONZE	MILD STEEL BRONZE	MILD STEEL BRASS	CERAMICS BRONZE
MEDUI M	WOODS PLASTIC S	ZINC LEAD	WOODS POLYSTYRENE	WOODS NYLON	TITANIUM WOODS	WOODS THERMOSET PLASTICS	WOODS THERMO PLASTICS	GLASS POLYSTER RESIN	MILD STEEL SOFT WOODS



**ELECTRICAL
CONDUCTIVITY**



**THERMAL
CONDUCTIVITY**



DENSITY

DURIBILTIIY



HARDNESS

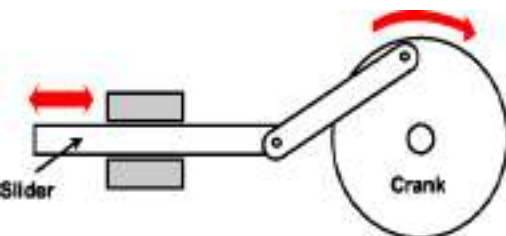
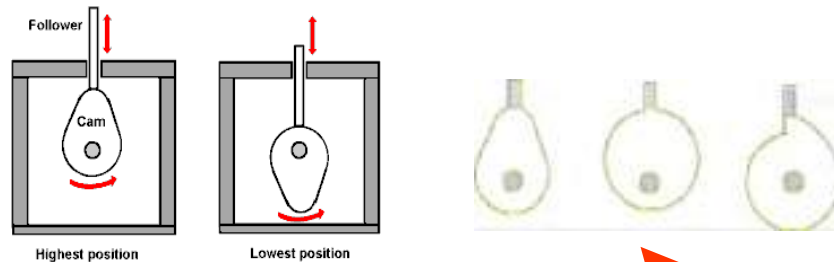


**THERMAL
CONDUCTIVITY**

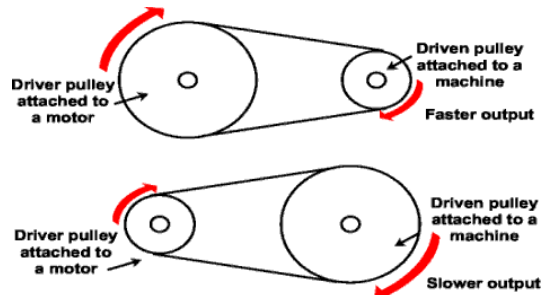
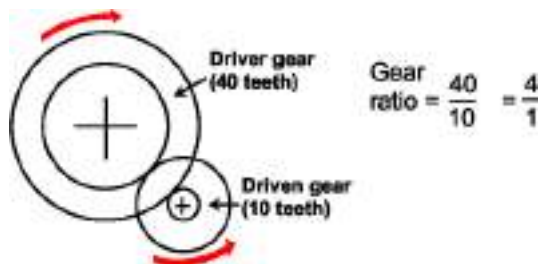


Knowledge & Understanding/ Key Words:

Cams

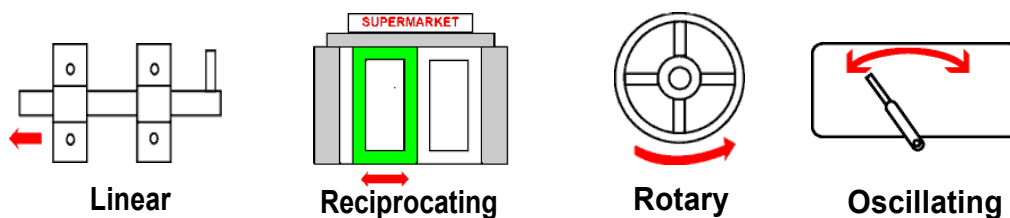


Gears

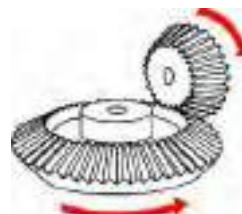


Mechanical systems

Types of movement



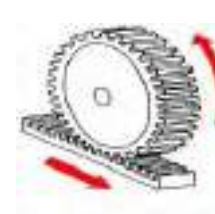
Bevel gears



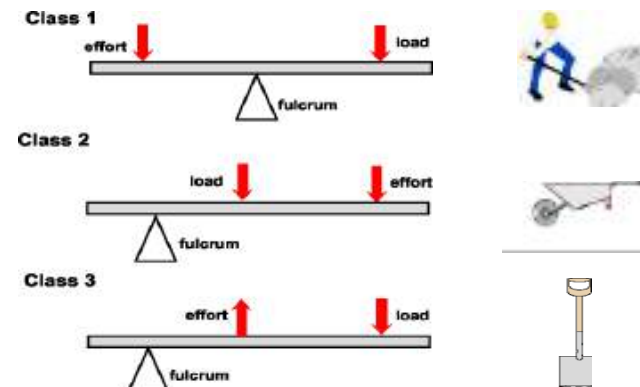
Worm gear



Rack and pinion

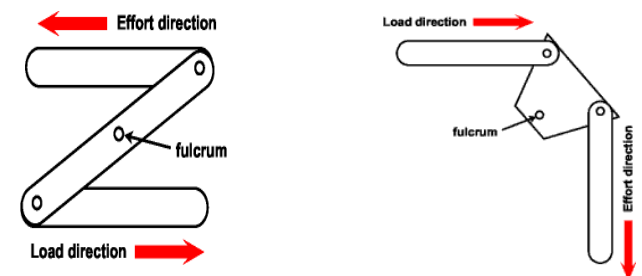


Levers

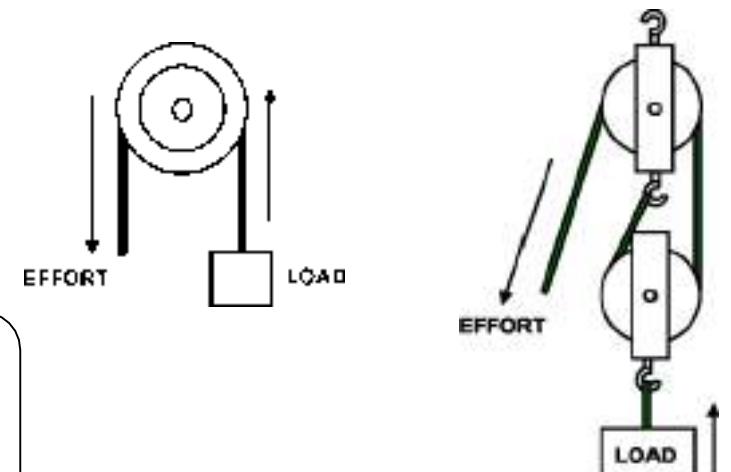


$MA = \text{LOAD} / \text{EFFORT}$

Linkages

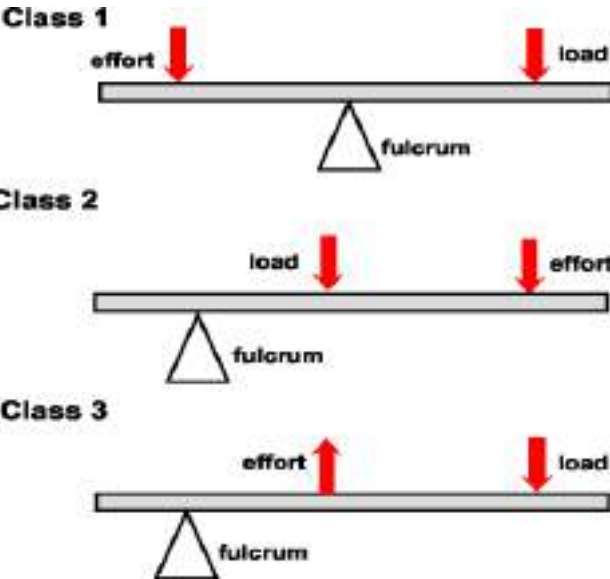


Pulleys

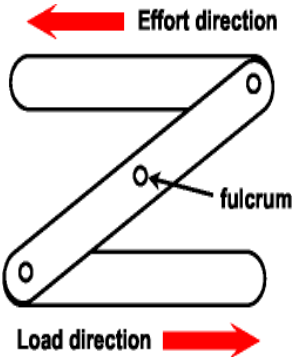
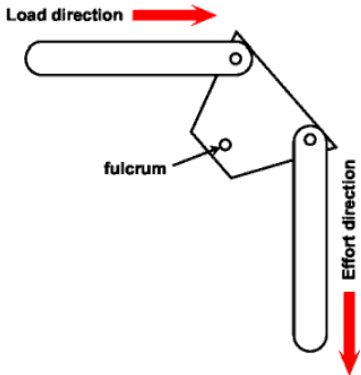


Knowledge & Understanding/ Key Words:

LEVERS



LINKAGES

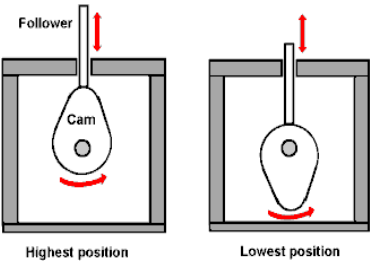


POP UP MECHANISMS

SPRINGS



CAMS



Knowledge & Understanding/ Key Words:

ANTHROPOMETRICS & ERGONOMICS

A designer needs to make sure that the sizes chosen for a design are ergonomically correct. To do this the designer will look up **anthropometric data**.

Every well designed product must be easy, comfortable and safe to use. The parts of the product that are touched by humans, e.g. handles, seats, table tops etc. are said to be **ergonomically designed**.



Knowledge & Understanding/ Key Words:

DESIGN PROCESS

The Problem

Every product is designed, made and sold to solve a problem. A new design may be needed because.....everything you use, hold, travel in, sail in, fly in.....has been designed for that specific function



BRIEF



RESEARCH



SPECIFICATION



DESIGN PROPOSALS



DEVELOPMENT
&
MODELLING



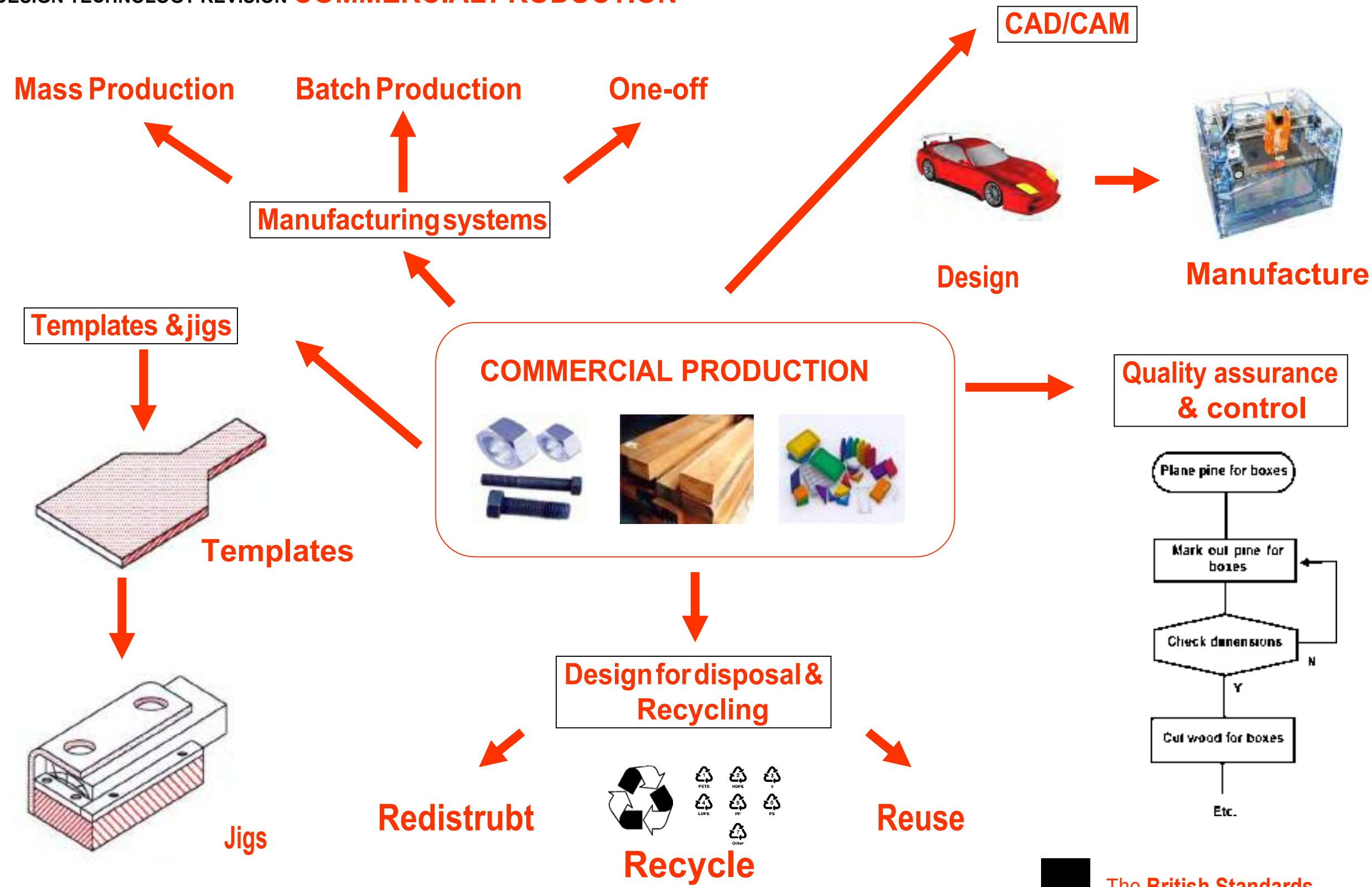
PLANNING



TESTING
&
EVALUATION

Knowledge & Understanding/ Key Words:

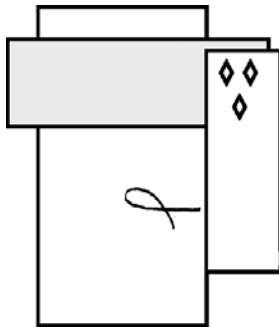
DESIGN TECHNOLOGY REVISION **COMMERCIAL PRODUCTION**



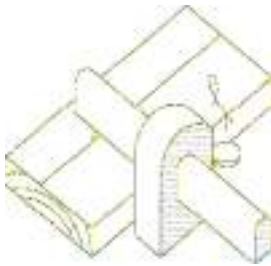
Knowledge & Understanding/ Key Words:

DESIGN TECHNOLOGY REVISION **MEASURING AND MARKING OUT MATERIALS**

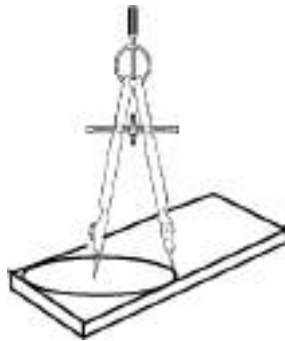
MATERIALS



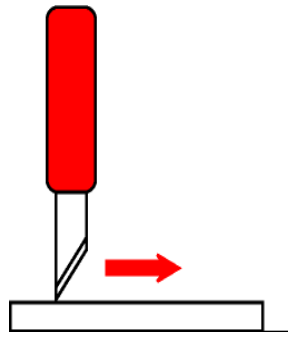
TRY SQUARE



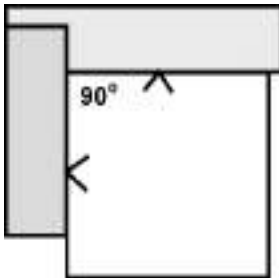
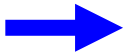
MARKING GAUGE



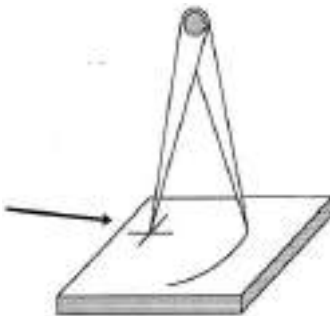
COMPASS



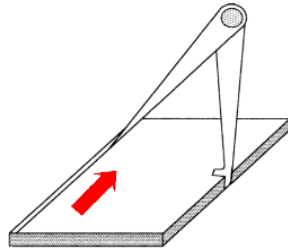
MARKING KNIFE



ENGINEERING SQUARE



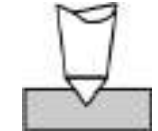
DIVIDERS



DOG LEG DIVIDERS



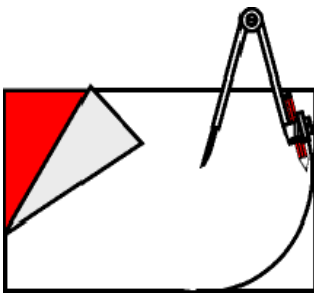
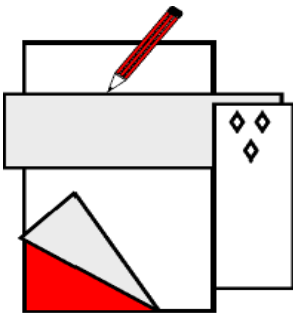
SCRIBE



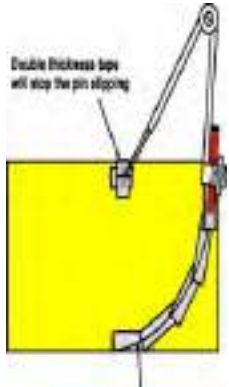
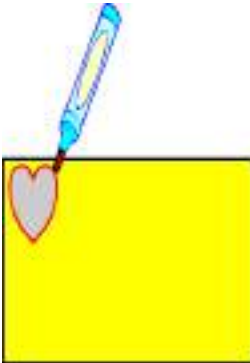
CENTRE PUNCH

Used to put a small dent in the surface to allow drill to bite.

SCRIBES & CALLIPERS Used to scratch the metals surface.



SAME EQUIPMENT AS WOOD LEAVING THE PROTECTIVE LAYER ON



USE MARKER PEN & MASKING TAPE

Knowledge & Understanding/ Key Words:

WOODS

3 TYPES OF WOODS

SOFTWOODS

HARDWOODS

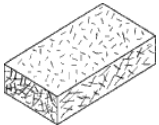
MAUFACTURED



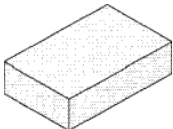
Coniferous
trees



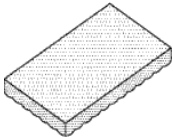
Deciduous
trees



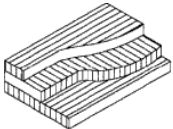
Chipboard



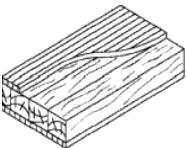
Hardboard



Plywood



Blockboard



Medium Density
Fibreboard (MDF)

Parana Pine



Cedar



Spruce



Scots Pine



Mahogany



Oak



Beech



Ash



Knowledge & Understanding/ Key Words:

DESIGN TECHNOLOGY REVISION **WOOD FUNCTIONAL PROPERTIES – USES & PRODUCTS**

SOFT WOODS

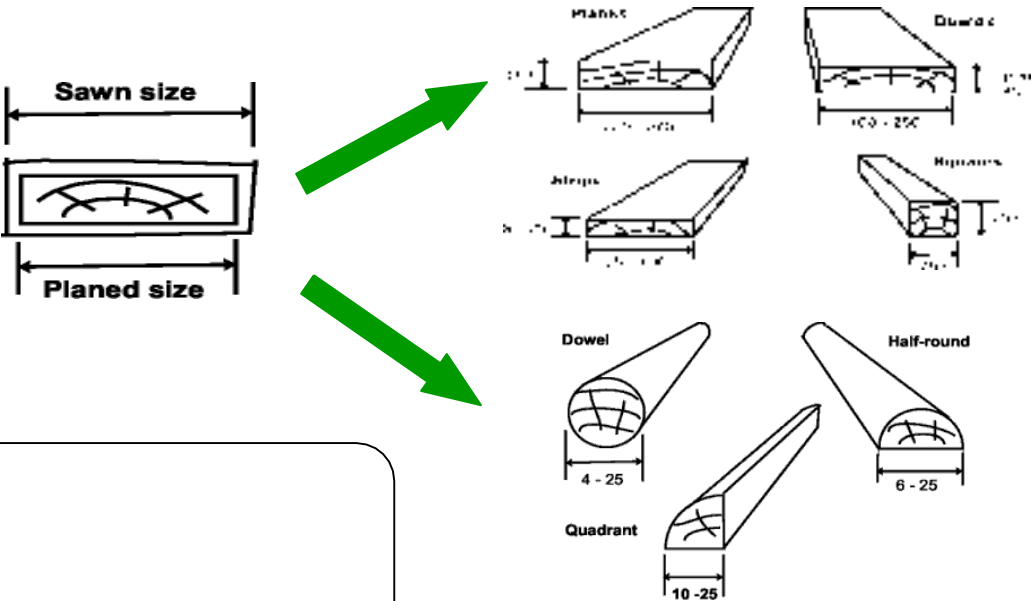
NAME	PROPERTIES	USES	COST
Scots Pine (Deal)	Straight grained, but knotty, quite strong and easy to work	Building construction. When used outside it needs protection. Takes paint well.	Low
Parana Pine	Straight grained with few knots, quite strong and durable, warps easily	High quality interior construction and furniture	High
Spruce (white-wood)	Quite strong, with small knots, resistant to splitting but not durable	Fitted furniture, e.g. kitchen cabinets.	Low
Cedar	Straight grained that is knot free. Very light in weight. Very durable, inside and outside. Quite soft.	Used outside for shed construction and quality fencing.	High

HARD WOODS

NAME	PROPERTIES	USES	COST
Ash	Light in colour, flexible and tough, steam bends well, varnishes well.	Tool handles, cricket bat handles, ladders, veneers.	Med
Beech	Mid-brown colour, hard, strong and tough, tends to warp, steam bends well.	High quality furniture, toys, tool handles, veneers	Med
Oak	Light brown, hard, tough, heavy and durable outside. Gets harder with age.	High quality furniture, garden furniture, boat building, veneers	High
Mahogany	Red in colour, medium weight, quite strong, durable inside, warps easily	High quality furniture, shop furniture, boat fittings, veneers.	High

MAUFACTURED

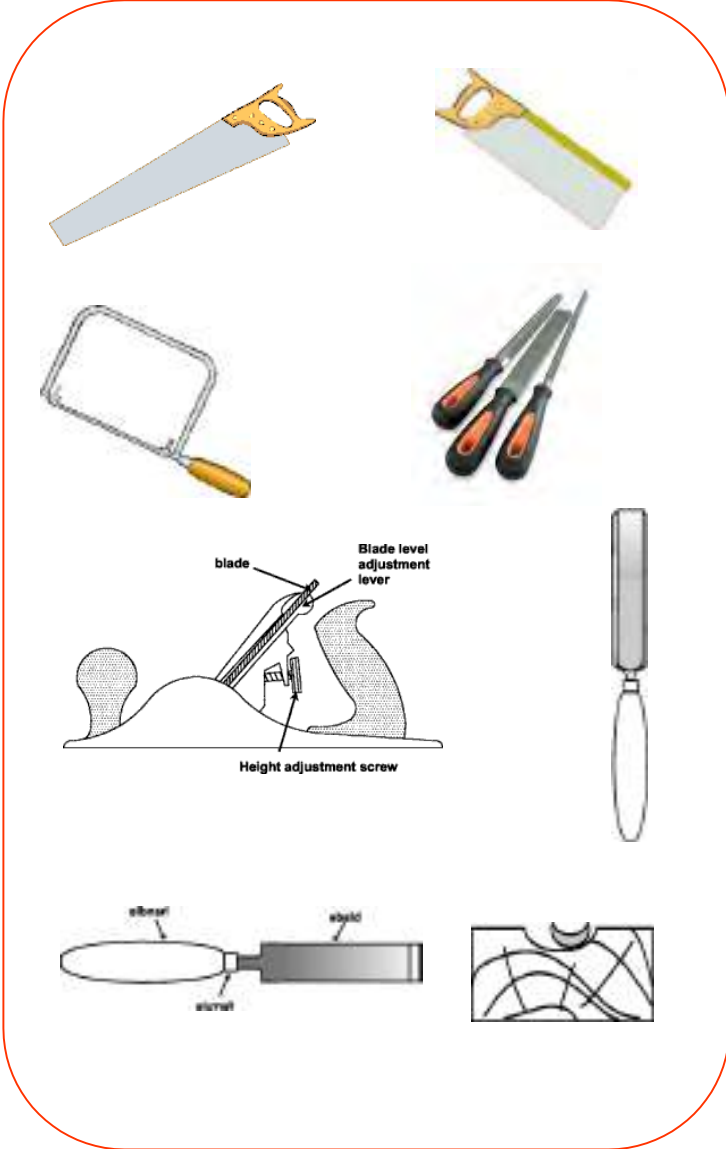
NAME	PROPERTIES	USES	COST
Plywood	Strong in all directions, quite stable but can warp. A water-proof ply is available.	Tabletops, worktops, door fronts, drawer bottoms, small boats (waterproof ply)	Med
MDF	Does not warp easily, cuts and planes well without splitting, needs a finish.	Tabletops, worktops, veneered furniture, clock cases.	Med
Blockboard	Does not warp easily. Very strong, rigid and rather heavy. Edge finishing is difficult.	High quality furniture, stage flooring, fire doors.	High
Chipboard	Heavy, can warp easily, joining pieces together is not easy, needs a finish.	Cheap plastic coated furniture, roofing boards, partitions	Low
Hardboard	Not very strong, warps easily, needs a finish.	Door panels, cheap drawer bottoms, cabinet backs.	Low



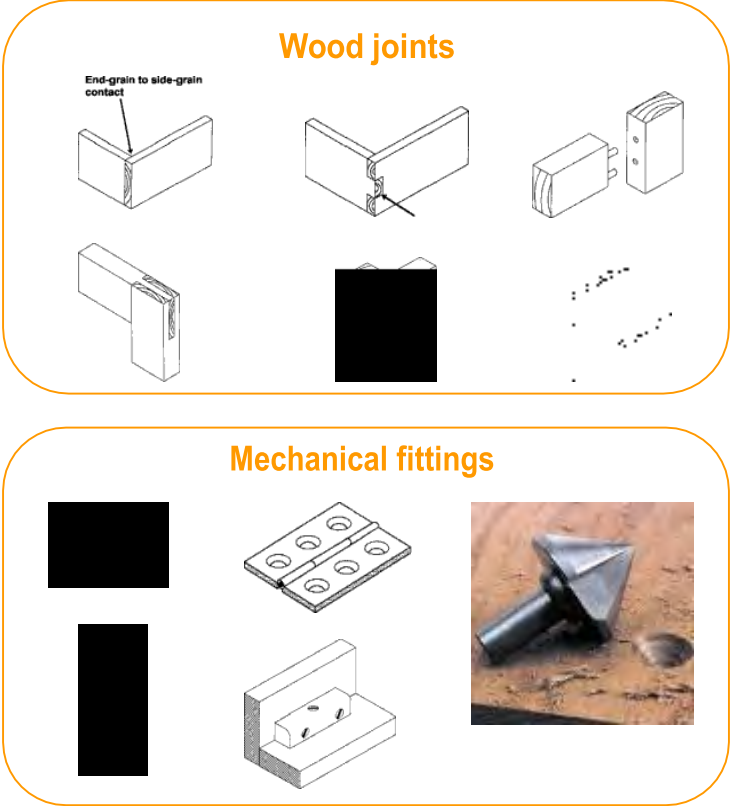
Knowledge & Understanding/ Key Words:

WOODS

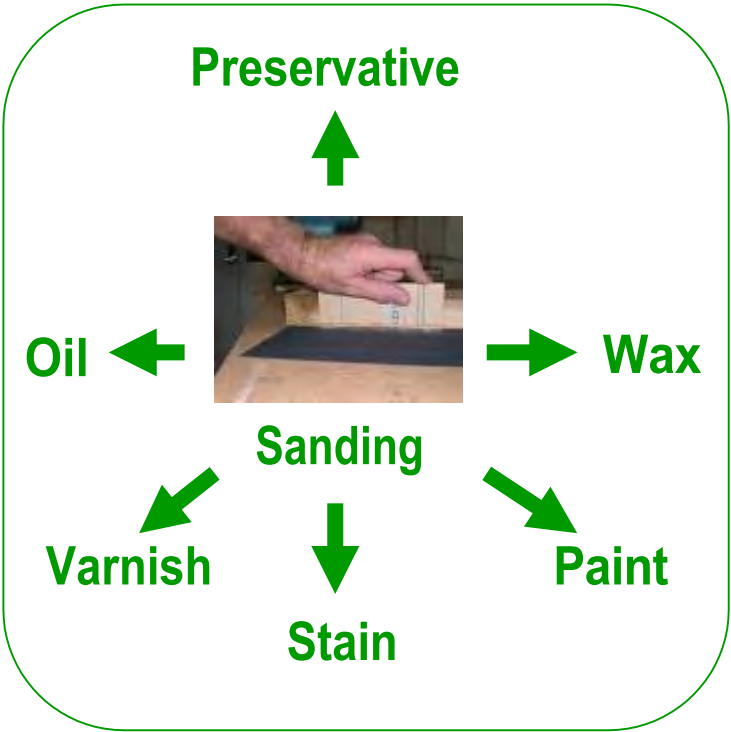
**CUTTING/SHAPING
(THE WASTING PROCESS)**



CONSTRUCTION & JOINING



FINISHING



ADHESIVE	SETTING TIME	COMMENTS
PVA (polyvinyl acetate)	1 hour	Non-toxic, white, water-based glue for general use. Normally water resistant when set.
Synthetic Resin (Cascamite)	2 - 6 Hours	Non-toxic, white, water-based glue. Used when extra strength is important. Waterproof when set.
Contact Adhesive (Evostick)	Instant	Highly toxic, brown, spirit based, waterproof glue. Used on nonporous surfaces. Must be used in a well ventilated area.
Glue sticks	15 Seconds	Non-toxic plastic. Not very strong. Only useful for spot gluing. Excess glue difficult to clear away

Knowledge & Understanding/ Key Words:

WOOD JOINTS

STRENGTH

JOINT

TOOLS

ADHESIVE



DOVE TAIL



HOUSING



BRIDAL



LAP



DOWEL



MITRE (45°)



BUTT

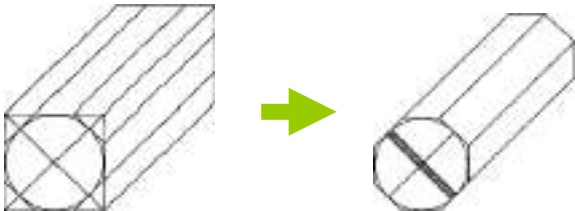


Knowledge & Understanding/ Key Words:

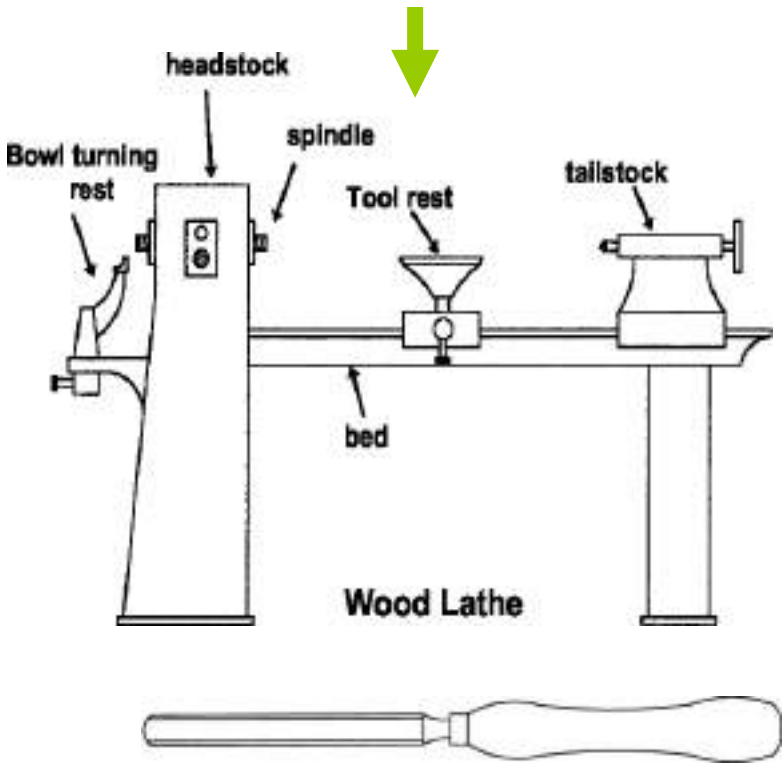
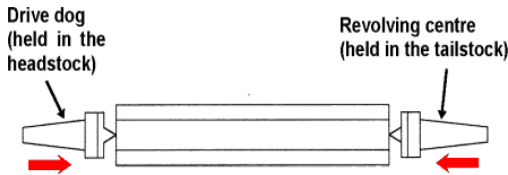
WITH WOOD JOINTS THE GREATER THE AREA OF SURFACE CONTACT THE STRONGER THE JOINT

Wood Turning

Preparation



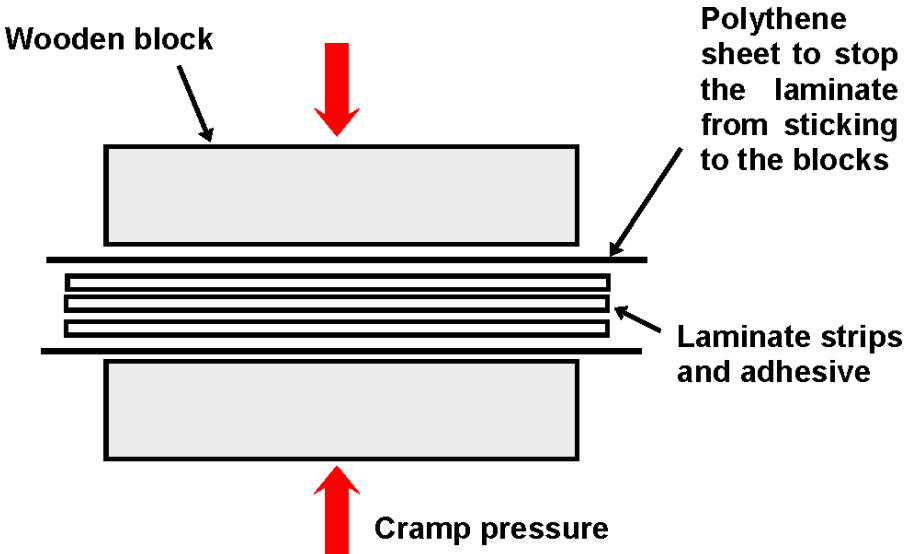
Mounting wood on lathe



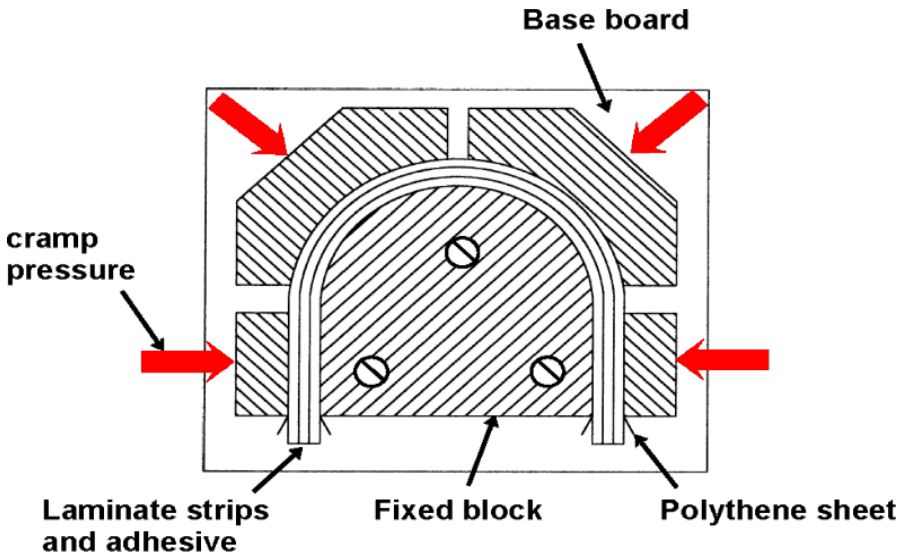
Tools



Flat-sheet lamination



3D-forms/shapes



Knowledge & Understanding/ Key Words:

Plywoods can be produced in flat sheet & 3D forms



Hand Router



The shape of the routerbit determines the shape of the profile

Chamfer	V-groove
Cove	Round Nose
Rabbeting	Dado
Round over	Dovetail
Roman Ogee	Beading



Handheld power tools



Cutting

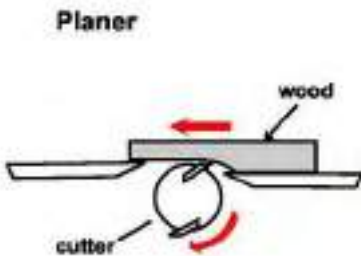
Drilling

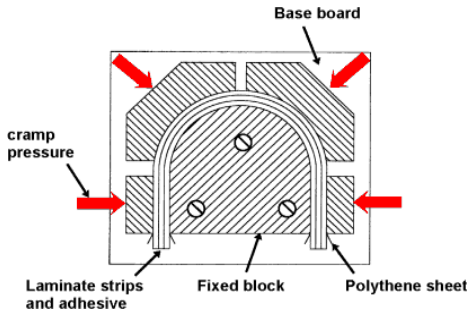
Planing

Sanding



Commercial machinery



PRODUCT	MATERIALS	MANUFACTURING	COMPONENTS & CONSTRUCTION
	BEECH Mid-brown colour, hard, strong and tough, tends to warp, steam bends well.		
	ASH Light in colour, flexible and tough, steam bends well, varnishes well.		
	MAHOGANY Red in colour, medium weight, quite strong, durable inside, warps easily		

METAL



2 CLASSES OF METALS

PUREMETALS **ALLOYS**



Ferrous

metals that **contain iron** and are affected by magnetism (apart from stainless steel).



Non ferrous

metals that **do not contain iron** and are not affected by magnetism

NAME	COMPOSITION	PROPERTIES	USES
Cast Iron	Iron + 3.5% carbon	Smooth skin with soft core, strong when compressed, self lubricating, cannot be bent or forged.	Vices, lathe beds, garden bench ends, car brake drums, etc
Mild Steel	Iron + 0.15 - 0.35% carbon	Ductile, malleable & tough, high tensile strength, poor resistance to corrosion, easily welded.	Car bodies, washing machine bodies, nuts & bolts, screws, nails, girders, etc.
High Carbon Steel (tool steel)	Iron + 0.8 - 1.5% carbon	Very hard, rather brittle, difficult to cut, poor resistance to corrosion.	Tool blades e.g. saws, chisels, screwdrivers, punches, knives, files, etc.
High Speed Steel	Iron + tungsten chromium vanadium	Very hard, heat resistant, remains hard when red	Drills, lathe cutting tools, milling cutters, power hacksaw blades etc.
Stainless Steel	Iron + chromium nickel magnesium	Tough and hard, corrosion resistant, wears well, difficult to cut, bend and file.	Cutlery, sinks, teapots, dishes, saucepans, etc.

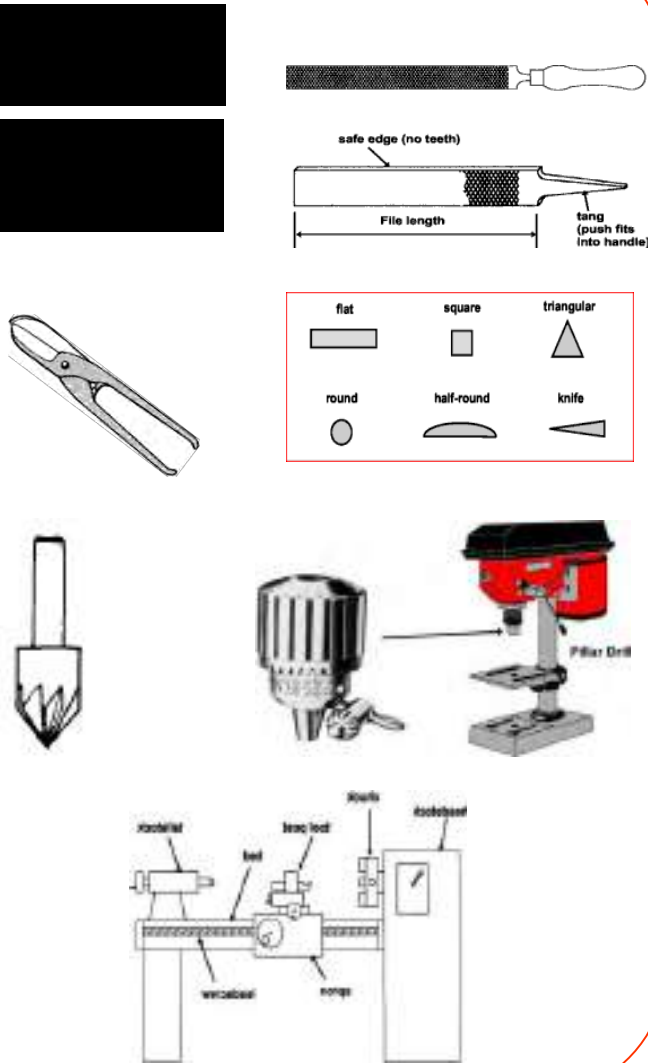
NAME	COMPOSITION	PROPERTIES
Aluminium	pure metal	Good strength/weight ratio, malleable and ductile, difficult to weld, non-toxic, resists corrosion. Conducts heat and electricity well. Polishes well.
Duralumin	aluminium + manganese magnesium	Stronger than pure aluminium, nearly as strong as mild steel but only one third the weight.
Copper	pure metal	Tough, ductile and malleable. Conducts heat and electricity well. Corrosion resistant, solders well. Polishes well.
Brass	copper + zinc	Quite hard, rigid, solders easily. Good conductor of heat and electricity. Polishes well.
Bronze	copper + tin	Tough, strong, wears very well, good corrosion resistance.
Tin	pure metal	Weak and soft, malleable and ductile, excellent corrosion resistance, low melting point.
Lead	pure metal	Soft, malleable, very heavy, corrosion resistant, low melting point, casts well, conducts electricity well.

Knowledge & Understanding/ Key Words:

MILD STEEL MOST COMMONLY USED IN SCHOOLS

METALS

CUTTING/SHAPING
(THE WASTING PROCESS)



CONSTRUCTION & JOINING

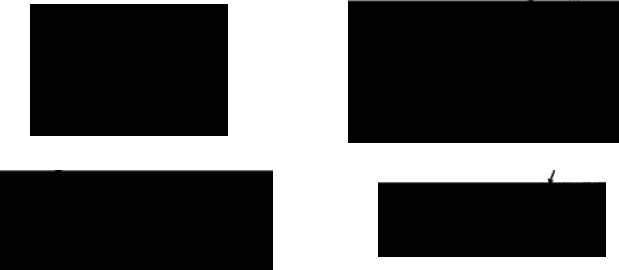
Permanent joints



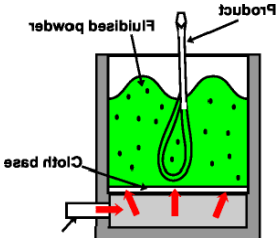
+ Same metal = Welding

+ Different metal = Brazing

Mechanical fittings



FINISHING



ALTERNATIVES

Painting

Lacquering

Plastic Coating

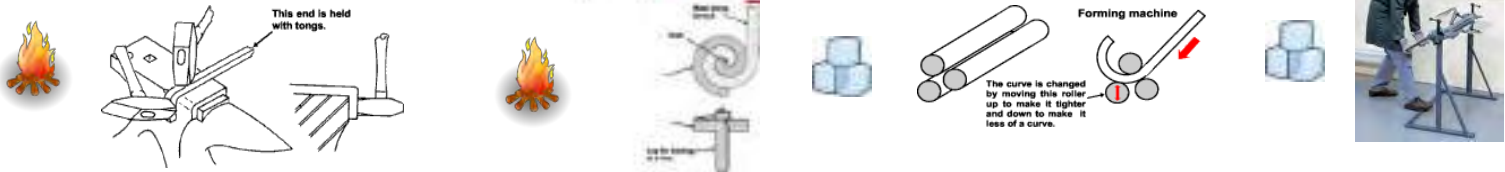
Enamelling

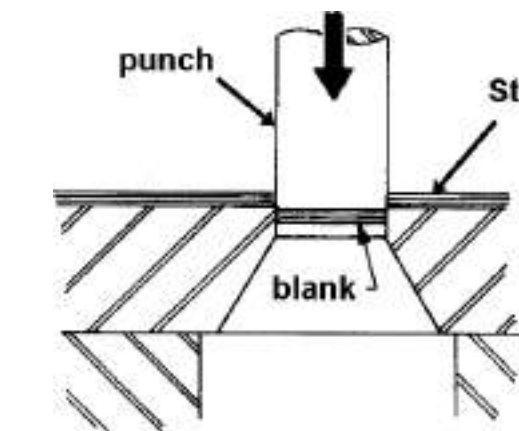
Vitreous enamel

Anodising

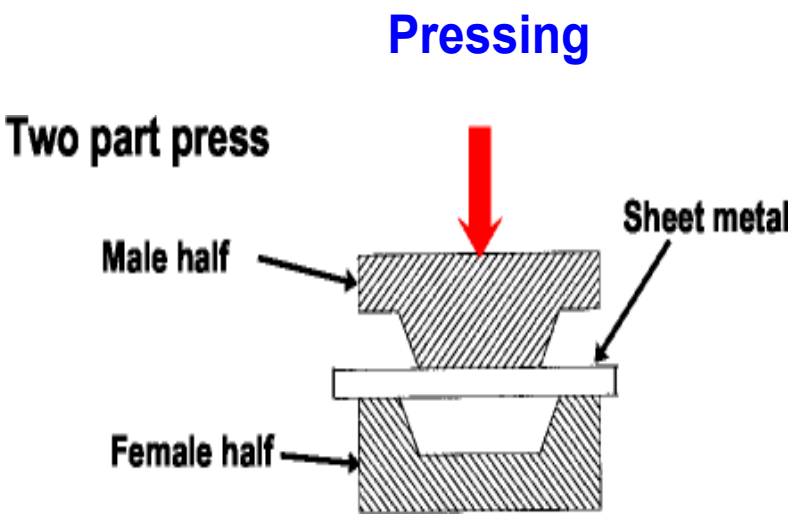
Electroplating

Shaping & forming

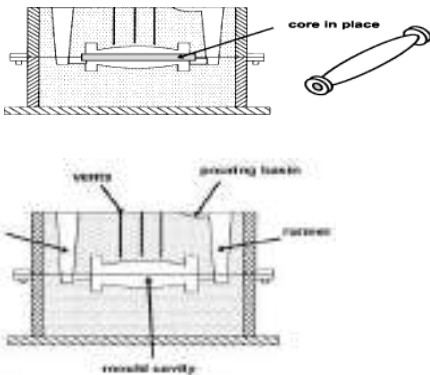
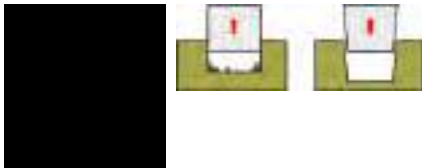




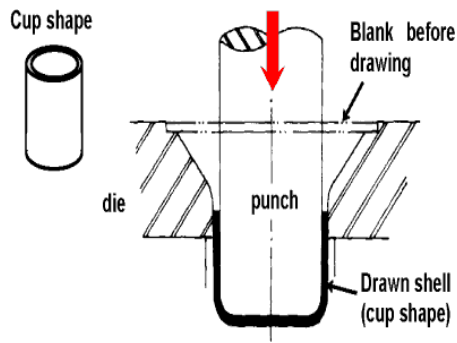
Punching



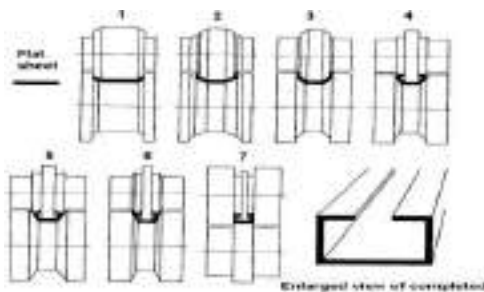
Pressing



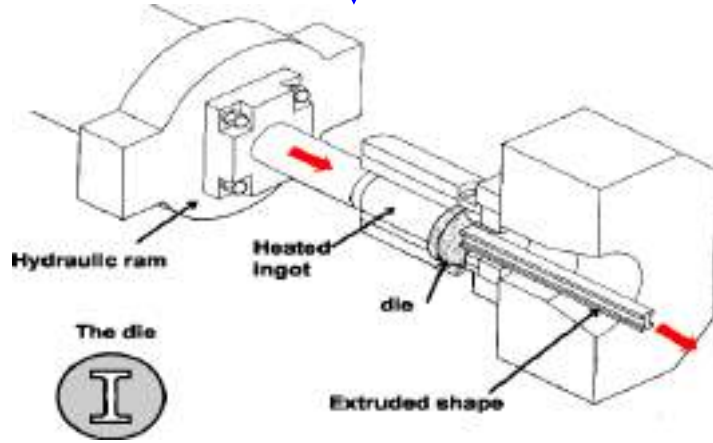
Sand casting



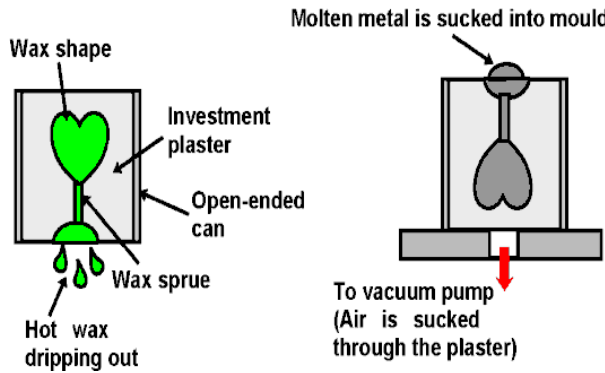
Pressing



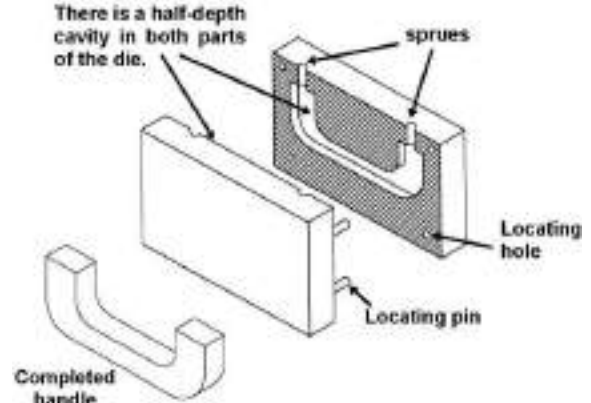
Rolling



Extrusion



Wax casting

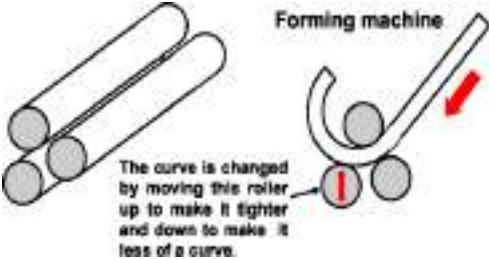
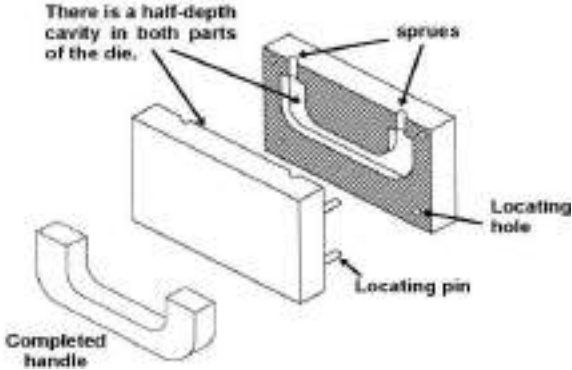


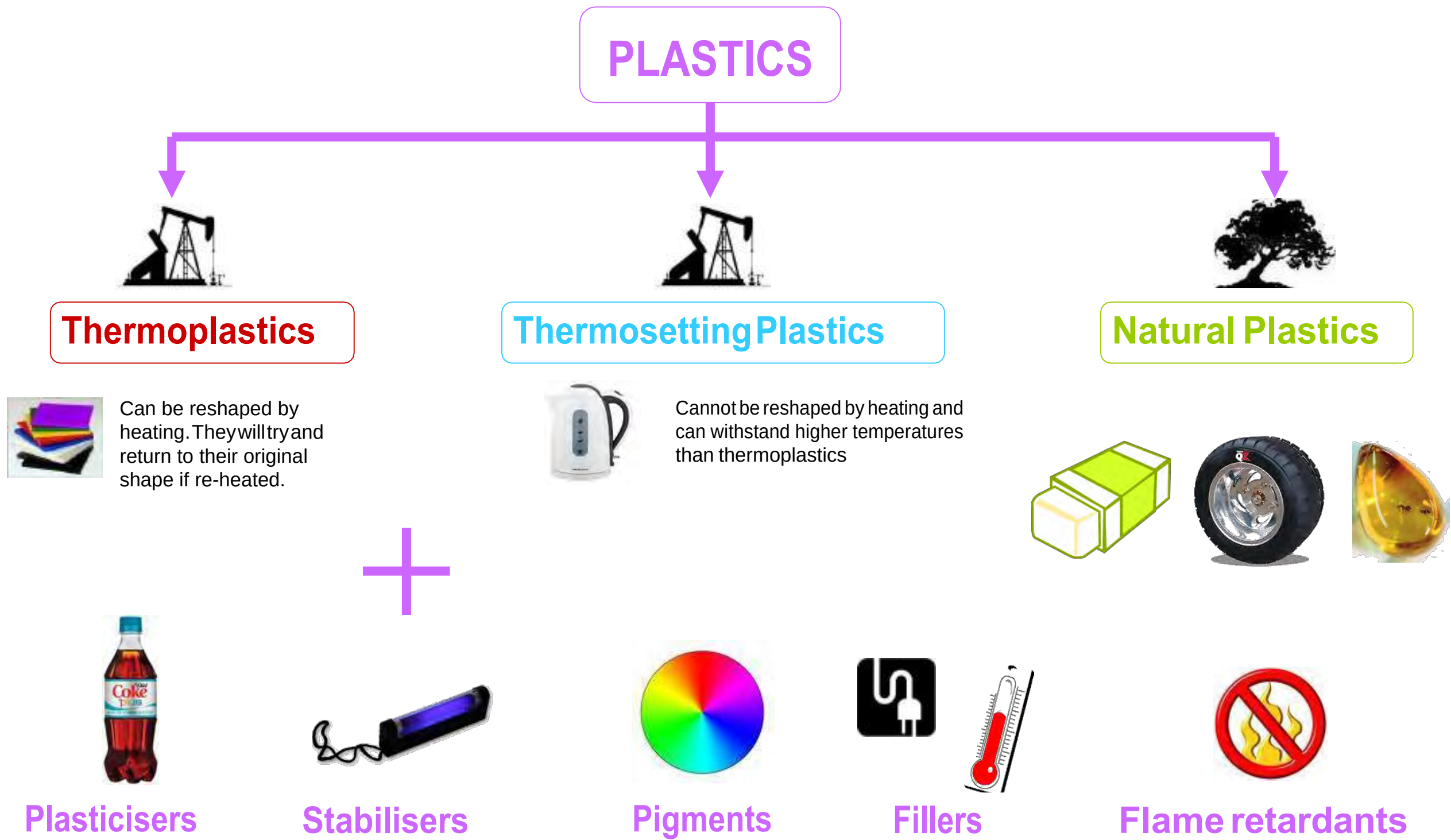
Die casting

METALS

Knowledge & Understanding/ Key Words:

SAND & WAX CASTING COMMONLY USED IN SCHOOLS

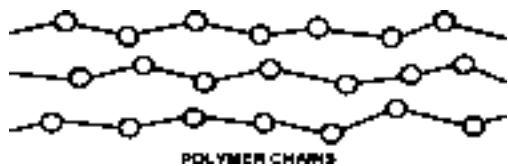
PRODUCT	MATERIALS	MANUFACTURING PROCESSES	COMPONENTS & CONSTRUCTION
	Aluminium Or Mild Steel		
	Mild Steel		
	Cast steel		



Knowledge & Understanding/ Key Words:

THERMOPLASTICS MOST COMMONLY USED IN SCHOOLS

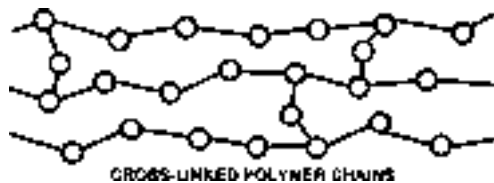
Thermoplastics



Plastics are made up of chains of polymers

PLASTICS

Thermosetting Plastics



Plastic	Type	Properties	Uses & products
Polymethyl-methacrylate	Acrylic PMMA	Rigid, hard, can be clear, very durable outside, polishes to a high shine.	Illuminated signs, windows, baths,
Polyethylene (polythene)		Flexible, soft, good chemical resistance, feels waxy	Food bags, buckets, bowls, bottles.
Polyamide	Nylon	Tough, self lubricating, resists wear, good chemical Resistance	Gear wheels, bearings, tights, Combs
Polystyrene	GPPS (General purpose) HHIPS (High Impact)	Lightweight, hard, rigid, can be clear, good water resistance	Model kits, utensils, containers, Packaging
Expanded Polystyrene		Very lightweight, floats, good heat insulator	Insulation, packaging
Polyethylene terephthalate	PET	Tough, clear, lightweight,	Fizzy drinks Bottles
Polypropylene	PP	Lightweight, flexible, resists cracking and Tearing	Climbing ropes, crisp packets
Polyvinyl Chloride	PVC	PVC can be clear or coloured, rigid or flexible,	Window frames, drainage pipe, water service pipe, medical devices,
Acrylonitrilebutadiene styrene	ABS	Very tough, scratch resistant, good chemical resistance	Casings for cameras, kettles, vacuum cleaners
Polyester resin (mixed with glass fibre))	GRP	Hard, rigid, brittle, tough when mixed with glass or carbon fibres	Boat and car bodies, paperweights
Epoxy resin	Araldite	Strong, good chemical and heat resistance, sticks to other materials well	Adhesive encapsulating electronic components
Urea formaldehyde	UF	Rigid, hard, strong, heat resistant, does not bend when heated, good electrical insulator	Electrical plugs and sockets, door knobs

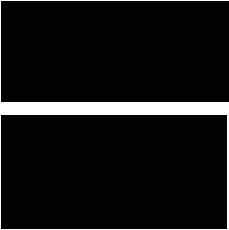
Knowledge & Understanding/ Key Words:

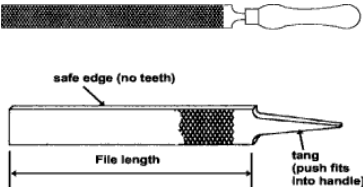
THERMOPLASTICS MOST COMMONLY USED IN SCHOOLS



PLASTICS

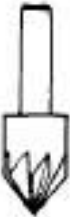
**CUTTING/SHAPING
(THE WASTING PROCESS)**



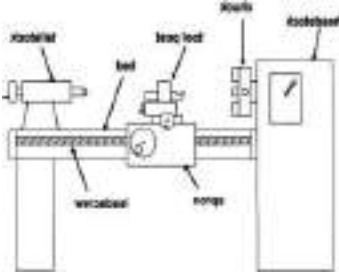




flat	square	triangular
round	half-round	knife



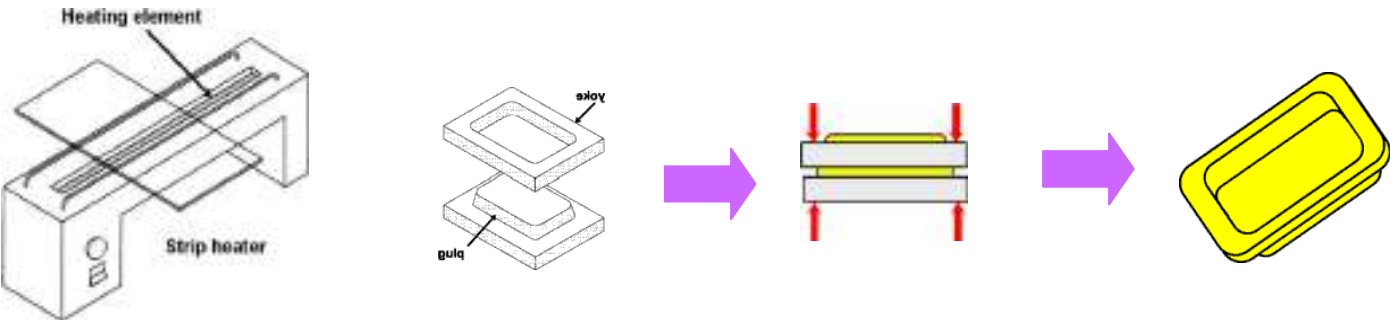






CONSTRUCTION & JOINING

Shaping & forming



Permanent joints

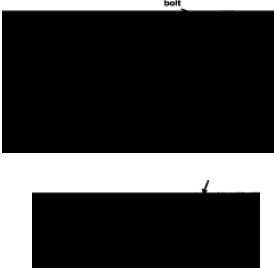


TENSOL CEMENT

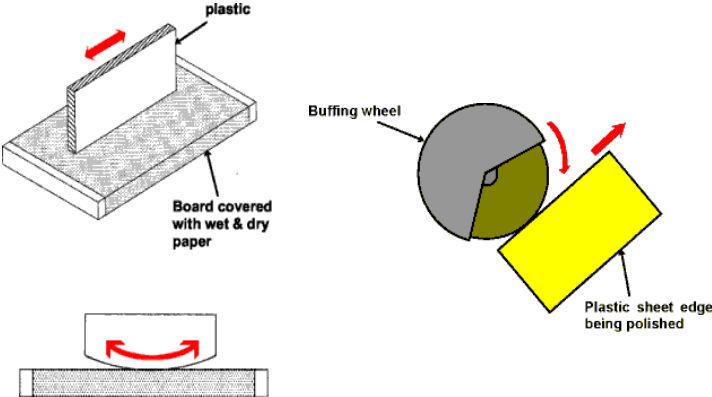


SUPER GLUE

Mechanical fittings

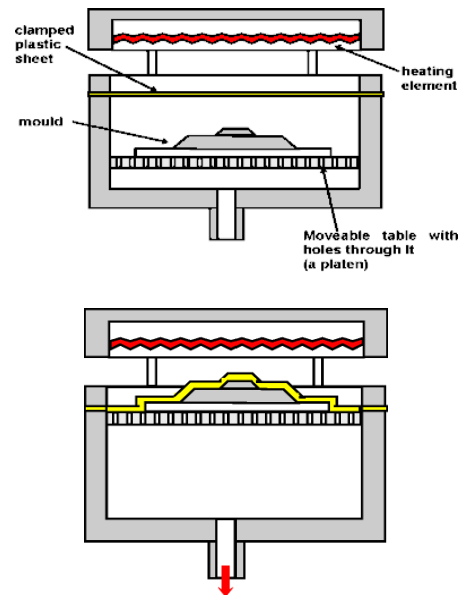


FINISHING

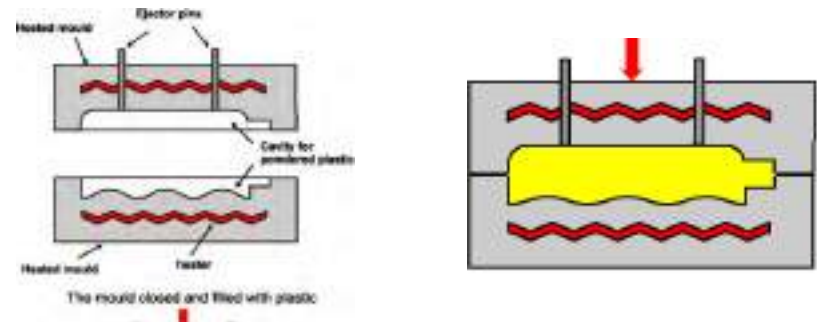


Knowledge & Understanding/ Key Words:

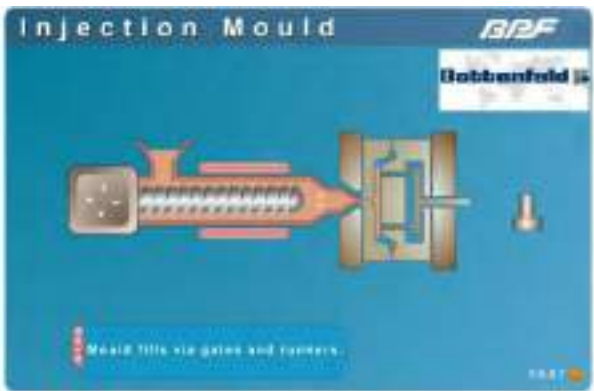
Vacuum Forming



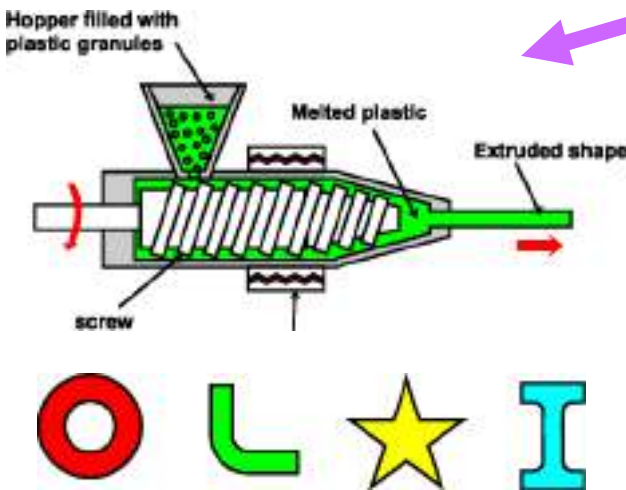
Compression Moulding



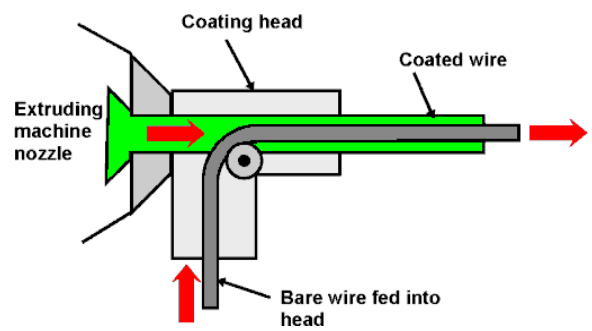
Injection Moulding



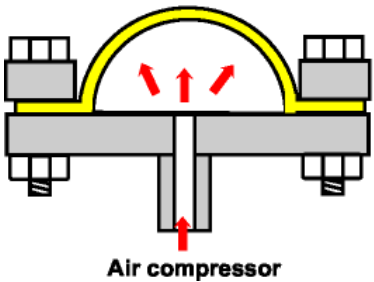
PLASTICS



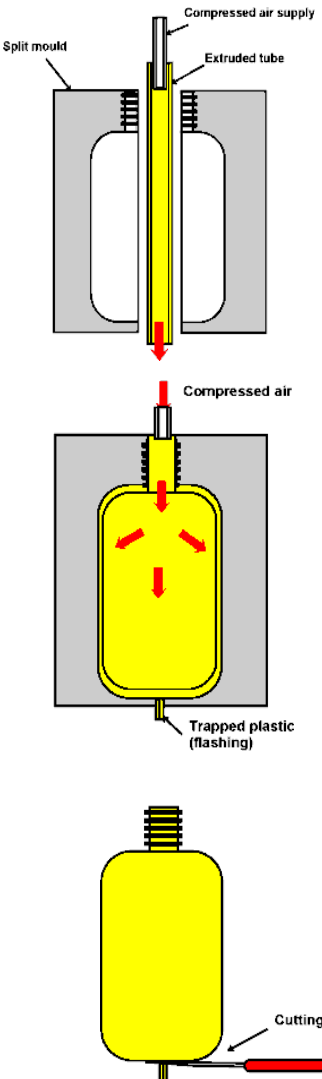
Extrusion



Extrusion coating

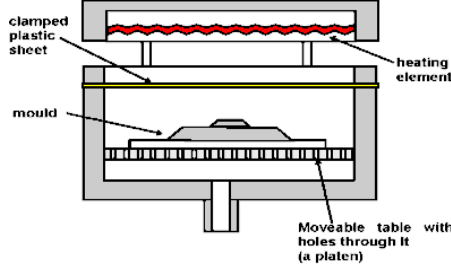
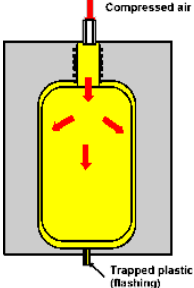


Blow moulding



Knowledge & Understanding/ Key Words:

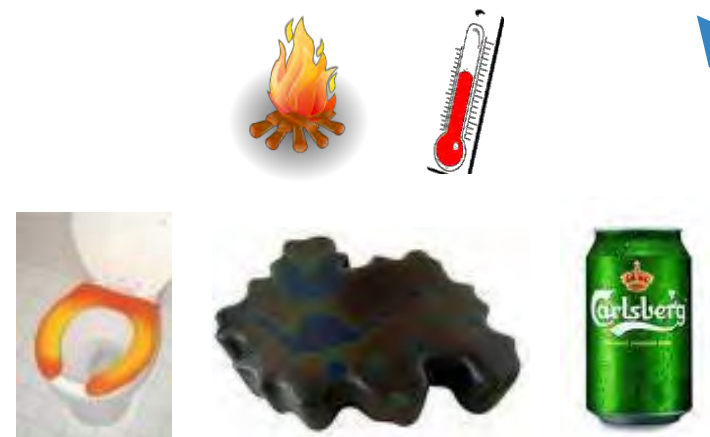
VACUUM FORMING MOST COMMONLY USED IN SCHOOLS

PRODUCT	MATERIALS	MANUFACTURING	COMPONENTS & CONSTRUCTION
 PACKAGING	Polyethylene (polythene)	 VAC FORMING	
 DYSON HOVER	ABS Acrylonitrilebutadiene styrene	 INJECTION MOULDING	
 BOTTLES	PET Polyethylene teraphthalate	 BLOW MOULDING	

Knowledge & Understanding/ Key Words:

VACUUM FORMING MOST COMMONLY USED IN SCHOOLS

Thermo chromatic



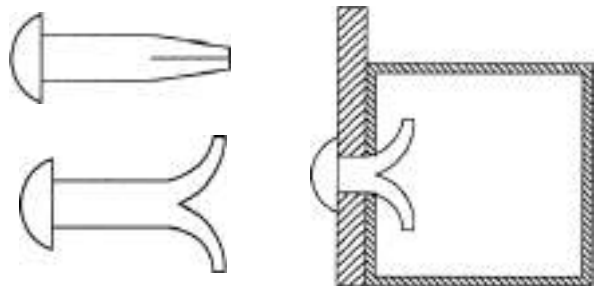
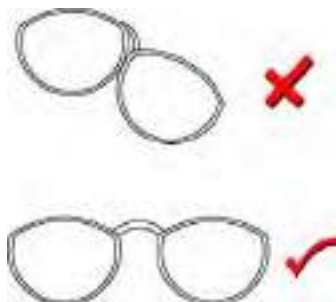
Polymorph



Plastic-Memory



Shape-Memory Alloys (SMA)



At room temperature the split rivet is in its open position. When cooled to below freezing, the rivet becomes straight.



SMART MATERIALS



A **smart material** is a material that can be controlled. It can be made to change its **colour, size or shape** and be returned to its **original form** at will.

The **control input** can be changing the **temperature** of the material, **applying an electric current** through the material or by **applying pressure** to the material.

Metamorphic



Super conductivity

