PERSONAL LEARNING CHECKLIST

RED AMBER GREEN

Natural woods
Hardwoods, including beech, oak, ash, mahogany, teak
Softwoods including: Scots pine, spruce, Douglas fir, and the availability of stock forms, including: rough sawn and P.S.E, 'FSC' marked softwood
Applications for natural woods e.g. furniture, decorative products, jewellery/craft, construction

Man-made boards
Man-made boards including: plywood, aero ply, flexiply, marine ply, chipboard, MDF and hardboard
Applications for man-made boards e.g. furniture, work surfaces and exterior projects

Laminates and veneers
Veneers such as beech, ash, oak, walnut, paper and foil backed
Laminates such as 'Formica' (coated printed paper or foil laminates)
Applications for veneers and laminates e.g. decorative surfaces, laminate flooring, jewellery furniture

Ferrous metals
Ferrous metals including: mild steel, high carbon steel, cast and wrought iron
Availability of stock forms such as sheet, bar, tube and angle
Applications for ferrous metals such as car body panels, tools, white goods and machine parts

Non-Ferrous metals
Non-ferrous metals including: aluminium, copper, zinc, gold, silver and titanium
Availability of stock forms e.g. sheet, tube, ingot
Applications for non-ferrous metals such as kitchen ware, jewellery, food wrapping, cans and electronics

Alloys
Ferrous alloys including: stainless steel, high speed steel and die (tool steel)
Applications for ferrous alloys e.g. kitchen ware, street furniture, cutting and press tools
Non-ferrous alloys including; bronze, brass, pewter, and duralumin/aluminium alloys
Applications for non-ferrous alloys such as ornaments, valves, boat fittings, sculpture, coins and jewellery

Polymers
Thermoplastics including: ABS, PET, PMMA (acrylic), Polypropylene, High Impact Polystyrene, Expanded Polystyrene, Low and High Density Polyethylene, Nylon and UPVC
Applications for thermoplastics such as mobile communications products, toys, car parts, packaging, kitchen ware, pipes and window frames
Thermosets including: Epoxy resins, Polyester resins, Urea Formaldehyde and Melamine Formaldehyde
Applications for thermosets such as decorative laminates, casting and encapsulation, tableware and electrical fittings

Biodegradable' polymers
Degradable polymers (Oxo-degradable)
Biodegradable polymers ('bio-batch' additive mixed polymers)
Compostable polymers including: cellulose based polymers such as Biopol, and corn starch based polymers such as Polylactide (PLA)
Applications for 'biodegradable polymers' such as carrier bags, plastic bottles and detergent sachets
Absorbable/water soluble polymers including: lactide, glycolide, ('Lactel') and 'Ecofilm'
Medical applications such as slow release medication, bone repair fixings, detergent washing liquid sachets

Elastomers
Common elastomers such as Thermoplastic Elastomers (TPE), Thermoplastic Rubber (TPR) and Liquid Silicon Rubber (LSR)
Applications for elastomers such as car bumpers and trims, and product grips (over mouldings)

Composites
Fibre Reinforced Polymers including: glass (GRP), Carbon Fibre (CFRP) and Kevlar
Applications for FRP such as boat building, sports car manufacture, performance sports equipment and body armour
Particle based composites including: concrete and cermets such as tungsten carbide
Applications for concrete such as structural building components, garden ornaments and paving
Applications for cermets such as cutting tools

Compliant materials
Paper: including layout paper, bleed proof, photo quality cartridge and watercolour
Applications such as design drawings, presentations and graphic products
Card including carton board, multi-sheet, laminated, corrugated, metal effects, and mount board
Applications such as model making and packaging
Reflective films and holograms
Applications such as reflective/warning patches, jewellery and security holograms
Polymer based sheet and films including: foam board, fluted and translucent polypropylene sheet, acetate, Styrofoam, modelling foam, low density polyethylene sheet, and plastazote foam
Applications such as packaging, point of sale displays, and model making

Smart Materials
Shape Memory Alloy (SMA), such as 'Nitonol' (Nickel-Titanium alloy). Applications such as flexible spectacles (superelastic wire), heat activated cable connectors, muscle wires, and fire sprinkler control
Thermochromic pigment (Smart colours). Applications such as thermometers, baby feeding products, kettles, steam irons, thermal warning patches, and hi-tech jewellery
Thermochromic sheet. Applications such as thermal warning patches, battery condition indicators and jewellery
Photochromatic pigment. Applications such as sunglasses, anti-flash visors, sun-blocking products and radiation indicators
Phosphorescent pigment. Applications such as emergency exit signs, jewellery and toys
Polymorph. Applications such as modelling grip prototypes

Modern Materials
Metal based, including: coated metals e.g. anodised aluminium sheet, nickel plated steels, polymer coated aluminium, Alu composite-(polythene cored aluminium sheet) Aluminium foam and titanium
Wood based-including: flexible MDF, flexi-ply, aircraft grade plywood, Hexaboard and paper backed veneers

Product components
Knock Down fittings including: Barrel nut and bolt, corner plates, block connectors and dowels
Common applications e.g. Flat Pack furniture Fastenings including: wood screws, self tapping screws and bolts
Common applications such as temporary joining methods

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Environmental/Sustainability Issues
Selection of materials and manufacturing processes to reduce environmental impact
The 3R's – (Reduce, Reuse, and Recycle) and application to design and manufacture

Adhesives
Common adhesives and uses including:
Solvent Cement/Tensol 12 for joining acrylic
PVA for wood and papers
Contact Adhesive (Evostik) for mixed materials such as laminate to MDF
Epoxy resin (Araldite) for mixed materials such as metals to woods
UV hardening adhesive (Superglue substitute)
Through study and detailed analysis of a wide range of products, candidates should begin to develop knowledge and understanding of the broader issues for the designer such as: environmental sustainability of products and their manufacture, ergonomic and anthropometrics, inclusive design, and consumer safety.

Ergonomics and anthropometrics
The application of ergonomics and anthropometrics such as in the use of product shaping, textures, colours, and physical size to promote ease of use

Inclusive Design
How designers meet the needs of all users, including the disabled, in a range of product areas

Consumer Safety
At AS level, candidates should have an understanding of the main methods designers and manufacturers employ to ensure products are safe to use.
They should be able to describe basic safety features in products such as electrical consumer goods, toys
Candidates should be able to describe simple safety tests that they might use on products.
Candidates should have a good understanding of the methods by which materials and components can be manipulated to manufacture products. Through study and first-hand experience in practical project work, candidates will also develop knowledge of the health and safety issues relevant to working with materials. Coursework projects may also provide an opportunity for students to learn about the use of computer aided design (CAD) and computer aided manufacture (CAM), and the use of basic quality control measures.

Fabrication methods:

Woods
Traditional joining methods including: mortise and tenon, dowel, dovetail and comb
Knock Down Fittings and fastenings

Metals
Permanent joining methods such as: soldering, brazing, riveting, welding (including oxy-acetylene, MIG and spot)
Temporary joining methods such as self-tapping screws, machine screws, nut and bolt

Plastics
Permanent joining methods including plastic welding and bonding with adhesives

Forming methods:

Woods
Techniques including steam bending and laminating

Metals
Techniques including: press forming, cupping and deep drawing, drop forging and wrought iron forging techniques

Plastics
Techniques including: vacuum forming, thermoforming and line bending

Composites
'Lay-up' resin techniques, laminating, casting including: concrete and resin

Redistribution methods
Casting (including: sand, die and investment)
Extrusion techniques to manufacture bar and profiles

Metals
Casting, spinning and pressing

Cermets
Sintering

Polymers
Moulding processes including: injection moulding, blow moulding, rotational moulding and compression moulding

Wasting processes
Common wasting processes including: drilling, turning and milling
Profile or shape cutting using routers, millers, flame cutting, and laser cutting
Piercing and blanking processes

CAM Processing
For example:
CNC laser cutters for 2D cutting and engraving sheet materials
CNC routers for 3D machining of block and sheet materials
CNC plotter cutters for 2D printing and cutting of vinyl
Use of 3D printers or stereo lithographic modellers to prototype designs

Finishing materials and processes:

Woods
Common forms of wood preservatives including: water based, exterior, stains, yacht varnish and polyurethane varnish
Finishes to enhance aesthetics e.g. gloss paints, stains and colour wash and wax finishes
Methods of application including: spray, dip and pressure treating
Laminate coverings for sheet materials

Metals
Primers including zinc and red oxide primers
Paints including acrylic and cellulose based
Method of application including: brush, spray, dip and powder coating
Plating including: chrome, silver and tin plated
Galvanizing
Dip coating with polymers
Brushed/polished stainless steel

Polymers
Pigments and stabilisers. Applied finishes including: acrylic paints and chrome effects

Health and Safety
COSHH-Control of Substances Hazardous to Health
Health and safety precautions associated with common school workshop processes
General health and safety measures carried out to protect employees in manufacturing industries
Risk assessments for hand and commercial processing

Quality Control
Inspection of stock materials for defects
Use of measuring devices including callipers, micrometers and go/ no go gauges
Use of drilling jigs and templates
Use of mitre saws and mitre blocks
Use of welding jigs or fixtures

RED AMBER GREEN