

# Proforma AS PLC: Personalised Learning Checklist

Content/Topic: PROD 1	Red	Amber	Green
<p><b>Natural woods</b></p> <p>Hardwoods, including beech, oak, ash, mahogany, teak</p> <p>Softwoods including: Scots pine, spruce, Douglas fir, and the availability of stock forms, including: rough sawn and P.S.E, 'FSC' marked softwood</p> <p>Applications for natural woods e.g. furniture, decorative products, jewellery/craft, construction</p> <p><b>Man-made boards</b></p> <p>Man-made boards including: plywood, aero ply, flexiply, marine ply, chipboard, MDF and hardboard</p> <p>Applications for man-made boards e.g. furniture, work surfaces and exterior projects</p> <p><b>Laminates and veneers</b></p> <p>Veneers such as beech, ash, oak, walnut, paper and foil backed</p> <p>Laminates such as 'Formica' (coated printed paper or foil laminates)</p> <p>Applications for veneers and laminates e.g. decorative surfaces, laminate flooring, jewellery furniture</p> <p><b>Ferrous metals</b></p> <p>Ferrous metals including: mild steel, high carbon steel, cast and wrought iron</p> <p>Availability of stock forms such as sheet, bar, tube and angle</p> <p>Applications for ferrous metals such as car body panels, tools, white goods and machine parts</p> <p><b>Non-Ferrous metals</b></p> <p>Non-ferrous metals including: aluminium, copper, zinc, gold, silver and titanium</p> <p>Availability of stock forms e.g. sheet, tube, ingot</p> <p>Applications for non-ferrous metals such as kitchen ware, jewellery, food wrapping, cans and electronics</p>			

## 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

## 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)

## 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

## 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.

## **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