

AS Examinations

Unit 1 – PROD1 Materials, Components and Application

50% of AS, 25% of A Level

2 hour written paper

80 marks

Based primarily on Materials and Components and consisting of three sections

Section 1 contains compulsory limited response questions

Section 2 offers a choice of one question from two

Section 3 contains one compulsory question

Available June only

Unit 2 – PROD2 Learning Through Designing and Making

50% of AS, 25% of A Level

Coursework – approx 50 hours

80 marks

Written (or electronic) design portfolio

Manufactured outcome(s)

Coursework may take a number of forms: a simple design-and-make project, two smaller projects or a portfolio of work

Available June only

A Level Examinations

Unit 3 – PROD3 Design and Manufacture

25% of A Level

2 hour written paper

84 marks

Based primarily on Design and Manufacture and consisting of two sections
Candidates answer three questions: one question from three in each section, plus a final question from either section.

Includes synoptic assessment

Available June only

Unit 4 – PROD4 Design and Making Practice

25% of A Level

Coursework – approx 60 hours

85 marks

Written (or electronic) design folder

Manufactured outcome

Candidates submit evidence of a simple, substantial designing and making activity

Available June only

AS + A2 = A Level

AS
Award
1551

A Level
Award
2551

AQA GCE PRODUCT DESIGN

This unit is the AS Centre-Assessed Component.

This is a design-and-make unit where knowledge of the AS subject content is applied to the design and making of the candidates' own projects.

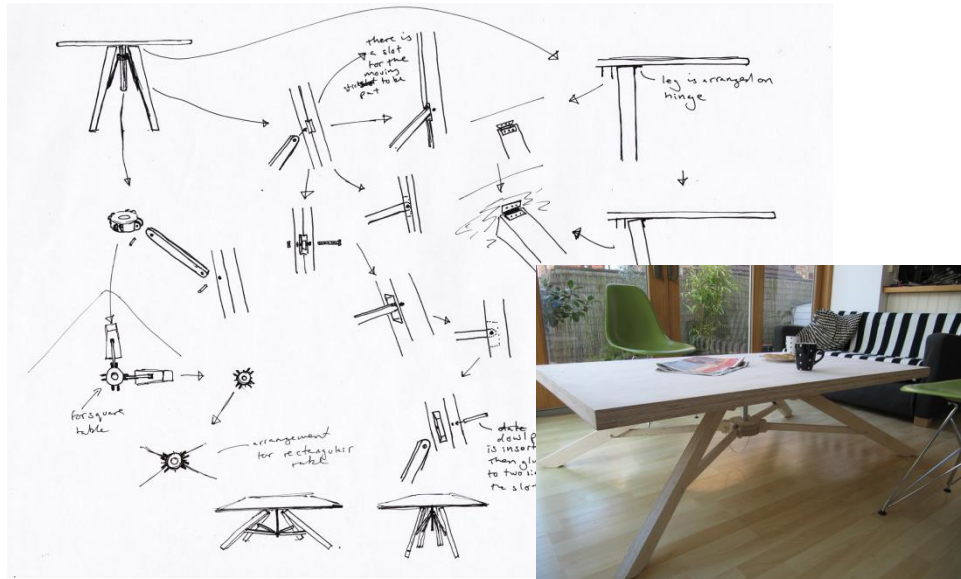
The Assessment Criteria for AS Coursework are given below. AQA will provide exemplar material and detailed guidance to illustrate the standard of work required for this coursework unit.

AS candidates' work will be marked out of a total of 80 marks.

Five criteria are produced for assessment and each criterion has five bands of marks. Each band should be viewed holistically when making assessments; a weakness in one element of a level, for example, can be balanced by strengths in another. Candidates who produce no work for a criterion, or who produce work below AS standard, should be awarded a mark of zero.

Summary of Assessment Criteria

Assessment Criteria	AO1 Designing	AO2 Making	Maximum Mark Allocation
1 Investigation and Clarification of Problems	8		8
2 Development of Design Proposal	24		24
3 Making / Modelling		24	24
4 Evaluation and Testing	8	4	12
5 Communication and Presentation	8	4	12
Total	48	32	80



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AQA GCE PRODUCT DESIGN

The Assessment Objectives are common to AS and A Level. Knowledge, understanding, skills and their applications are closely linked.

AS and A level specifications should require that all candidates demonstrate the following Assessment Objectives in the context of the content and skills set out in Section 3 (Subject Content).

The Assessment Objectives apply to the whole specification for AS and A Level.

AO1 Candidates should demonstrate specific knowledge and understanding and be able to apply that knowledge and understanding in combination with appropriate skills in their designing; and should communicate ideas and outcomes and demonstrate strategies for evaluation

AO2 Candidates should be able to demonstrate and apply skills, knowledge and understanding of relevant materials, processes and techniques, and use materials and equipment to produce suitable and appropriate outcomes; and should communicate ideas and outcomes and demonstrate strategies for evaluation

Quality of Written Communication (QWC)

In GCE specifications which require candidates to produce written material in English, candidates must:

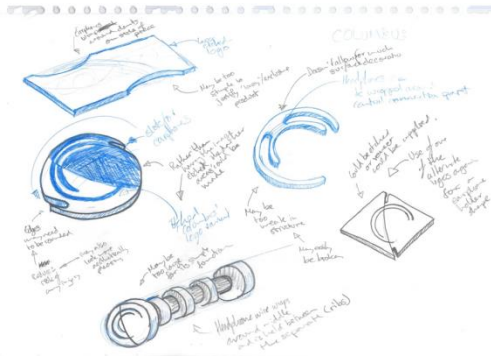
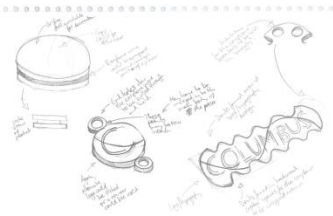
- ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear
- select and use a form and style of writing appropriate to purpose and to complex subject matter
- organise information clearly and coherently, using specialist vocabulary when appropriate.

In this specification QWC will be assessed in Units 2, 3 and 4 by means of specific criteria incorporated within the mark schemes.

Weighting of Assessment Objectives for AS

The table below shows the approximate weighting of each of the Assessment Objectives in the AS units.

Assessment Objectives	Unit Weightings (%)		Overall weighting of AOs (%)
	Unit 1	Unit 2	
AO1	30	30	60
AO2	20	20	40
Overall weighting of units (%)	50	50	100



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Criterion 1 Mark Band	Investigation and Clarification of Problems
7 – 8	<ul style="list-style-type: none"> • Comprehensive, organised range of sources of information including relevant practical investigations, taking into account current trends, available technologies and the needs of the client • Perceptive analysis of information • Comprehensive specification, well reasoned and based on research and investigation
Criterion 2 Mark Band	Development of Design Proposal
19 – 24	<ul style="list-style-type: none"> • Comprehensive, imaginative and feasible ideas • Excellent development of a sophisticated/elegant solution achieved by exploring and experimenting with different proportions, material combinations and the functions of materials, methods of production, construction and modelling • Full explanation of all decisions made • Comprehensive and detailed plan of making, including relevant quality control checks, in order to achieve a high quality outcome in the stated time
Criterion 3 Mark Band	Making/Modelling
19 – 24	<ul style="list-style-type: none"> • High level of making/modelling skills and accuracy using a varied range of materials with ability to adapt the original idea • Planned quality control checks are applied throughout the making/modelling to ensure consistency and safety • Outcome satisfies all major points of the specification • In-depth and detailed use of appropriate modelling strategies which help clarify the form of the prototype or product and production/manufacturing methods
Criterion 4 Mark Band	Evaluation and Testing
9 – 12	<ul style="list-style-type: none"> • Detailed and comprehensive testing strategy applied throughout with results used to inform the design and refine any modifications • All aspects of the final prototype or product tested and evaluated against the specification • Comments of others used appropriately to develop the prototype or product to improve the effectiveness of the final outcome
Criterion 5 Mark Band	Communication and Presentation
9 – 12	<ul style="list-style-type: none"> • Excellent level of communication and presentation, including competent use of appropriate technical language • Excellent wide range of appropriate materials, techniques and media used to convey details of designing and making • Complex ideas expressed extremely clearly and fluently in a structured and relevant way with few, if any, errors of grammar, punctuation and spelling

These criteria mark descriptions refer to A*-A coursework outcomes

Product Design AS Level

Personalised Learning Checklist

Name:

Section A: Materials & Components	Confident	Developing	With difficulty
Natural woods			
Hardwoods , including beech, oak, ash, mahogany, teak			
Softwoods including: Scots pine, spruce, Douglas fir			
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, flexi ply, 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			
Section C: Processes and Manufacture			
Fabrication methods:			
Traditional joining methods including: mortise and tenon, dowel, dovetail and comb			
Knock Down Fittings and fastenings			
Forming methods:			
Techniques including steam bending and laminating			

Finishing materials and processes:			
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			
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 kitchenware, 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			
Section C: Processes and Manufacture			
Fabrication methods:			
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			
Forming methods:			
Techniques including: press forming, cupping and deep drawing, drop forging and wrought iron forging techniques			
Redistribution methods:			
Casting (including: sand, die and investment)			
Extrusion techniques to manufacture bar and profiles			
Spinning			
Pressing			
Finishing materials and processes:			
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			
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)			
Section C: Processes and Manufacture			
Fabrication methods:			
Permanent joining methods including plastic welding and bonding with adhesives			
Forming methods:			
Techniques including: vacuum forming, thermoforming and line bending			
Redistribution methods:			
Casting (including: sand, die and investment)			
Extrusion techniques to manufacture bar and profiles			
Moulding processes including: injection moulding, blow moulding, rotational moulding and compression moulding			
Finishing materials and processes:			
Pigments and stabilisers.			
Applied finishes including: acrylic paints and chrome effects			
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			
Section C: Processes and Manufacture			
Forming methods:			
Lay-up' resin techniques, laminating, casting including: concrete and resin			
Redistribution methods:			
Sintering cermets			
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 'Nitinol' (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, antirflash 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)			
Section B: Design and Market Influences			
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.			
Section C: Processes and Manufacture			
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			
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			
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			

Reading List

Books	
Title:	Author(s):
AQA Design and Technology: Product Design (3-D Design). Nelson Thornes. ISBN 978-0-7487-8257-4	Brian Evans & Will Potts.
Cool Hunting Green	Dave Evans
The Eco-Design Handbook	Alastair Faud -Luke
Design Museum: Contemporary Design	Catherine McDermott
Arts & Crafts Companion	Pamela Todd
50 Product Designs: Process	Jennifer Hudson
Designs of the Times	Lakshmi Bhaskaran
Bauhaus	Benedict Taschen
Making IT Manufacturing Techniques For Product Design	Chris Lefteri
Memphis	Bigite Fitoussi
The Measure of Man and Women: Human Factors in Design	Alvin R. Tilley & Henry Dreyfuss Associates
Drawing For Designers	Alan Pipes
Designed for Kids	Phyllis Richardson
German Design: The classics	Bernd Polster
Italian Design	Daab

ICT Resources	
AQA Design and Technology: Product Design (3-D Design) On-Line Resources – Nelson Thornes.	Brian Evans, Will Potts, Robert Woolridge & Steve Milton.
TEP Materials Selection Database - Middlesex University Teacher Resources	
Focus Educational Software Ltd CD ROMS- Plastics, Metals, Woods, KD Fittings	
http://www.design-technology.org	
http://www.technologystudent.com	
http://www.cutepdf.com/	(free PDF converter)

CAD Resources	
ProDesktop or ProEngineer	(DATA)
Techsoft 2D Design	
http://sketchup.google.com	(free downloadable 3D CAD)
http://www.caligari.com	(free downloadable high spec 3D CAD)

Posters
Design Classics- bluefishworks.com
Inside Out series- bluefishworks.com
Clock works- bluefishworks.com
Alessi- bluefishworks.com

Videos/DVD
From Design to Manufacture (Isokon furniture) - Bluefish
Past Forward (1930's and contemporary furniture) - Bluefish
www.youtube.com (manufacturing processes)

Style guide

For AS Level Product Design, you should be able to:

- Demonstrate specific knowledge and understanding of the working characteristics and potential application of materials, ingredients, components and their uses and/or systems and control including preparation and processing.
- Write an appropriate brief and specification.
- Show that you understand quality issues.
- Learn and use correct technical language in all written work.
- Communicate understanding of the principles of testing materials and/or components.
- Research and communicate a broad range of ideas and information effectively in a creative and innovative way through some recognition of values issues or uniqueness or connections with other ideas.
- Order the main features of industrial and commercial practices related to manufacturing systems including the use of ICT and stages of production.
- Write about health and safety issues through the regulatory and legislative framework.
- Demonstrate clear strategies for testing and evaluating by taking into account form and function of a product, trends and styles of products reflecting environmental, cultural and ethical/moral issues as well as stylistic and engineering considerations.
- Analyse and assess information and ideas in appropriate ways, including ICT, enabling others to interpret them.