

**DESIGN AND TECHNOLOGY 9705
GCE A/AS Level
FOR EXAMINATION IN 2008**

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DESIGN AND TECHNOLOGY

**GCE Advanced Subsidiary Level
GCE Advanced Level 9705,
Available in November**

CONTENTS

	<i>Page</i>
INTRODUCTION	1
AIMS	1
ASSESSMENT OBJECTIVES	2
SPECIFICATION GRID	3
ASSESSMENT	4
CURRICULUM CONTENT	6
COUSEWORK PROJECT ASSESSMENT	15
COURSEWORK ASSESSMENT CRITERIA	17

NOTES

From 2006, this syllabus is available for examination in **NOVEMBER ONLY**.

Copies of syllabuses, past papers and Examiners' Reports are available on CD ROM and can be ordered using the Publications Catalogue, which is available at www.cie.org.uk under 'Qualifications & Diplomas' – 'Order Publications'.

INTRODUCTION

This syllabus is concerned with design activity including the manufacture of artefacts. The structure is designed to allow progression from corresponding GCE O Level, IGCSE or GCSE syllabuses and will allow candidates to develop their skills and acquired knowledge.

Centres and candidates may choose:

- to take all Advanced Level components in the same examination session; or
- to follow a **staged** assessment route to the Advanced Level by taking the Advanced Subsidiary qualification in an earlier examination session; subject to satisfactory performance candidates are then only required to take components 3 and 4 to achieve the full A Level;
- to take the Advanced Subsidiary qualification only.

Candidates will have the opportunity to investigate and develop specialist areas of interest, within Design and Technology, through the Coursework Project in the Advanced Subsidiary assessment and, in addition, through one of the following focus areas at A Level:

Product Design
Practical Technology
Graphic Products

AIMS

Students following a course in Design and Technology should be encouraged to:

- develop and sustain their own innovation, creativity and design and technology capability, to recognise constraints and to produce high quality products;
- develop awareness of the significance of design and technology upon society;
- apply essential knowledge, understanding and skills of design production processes to a range of technological activities and develop an understanding of industrial practices;
- use information and communications technology (ICT), as appropriate, to enhance their design and technological capability;
- develop critical evaluation skills in technical, aesthetic, economic, environmental, social and cultural contexts;
- develop as discerning consumers able to make informed choices;
- develop positive attitudes of co-operation and citizenship and work collaboratively.

Most of these Aims are reflected in the Assessment Objectives, others, however, cannot be readily assessed.

ASSESSMENT OBJECTIVES

Assessment objectives represent those aspects of the aims that will be assessed.

The three assessment objectives in Design and Technology are:

- A** Knowledge and Understanding
- B** Design analysis, generation of ideas and synthesis
- C** Practical implementation

A description of each assessment objective follows:

A KNOWLEDGE AND UNDERSTANDING

Students should be able to demonstrate knowledge and understanding in relation to:

- a range of materials and components used for the production of artefacts;
- a range of tools, equipment and associated processes used in design and technological activity;
- the impact of design and technology upon society;
- communication using a range of graphical techniques including conventions and specialist vocabulary.

B DESIGN ANALYSIS, GENERATION OF IDEAS AND SYNTHESIS

Students should be able to:

- prepare a design brief relating to a situation or need;
- search out, select and order information relevant to a design problem;
- analyse situations of need and produce a specification of requirements, taking account of human, aesthetic, technical and environmental factors;
- generate and explore a range of conceptual ideas;
- appraise ideas leading to the selection and modelling of a design proposal;
- refine and develop in detail a design proposal suitable for implementation, recognising constraints of time, cost and accessible resources.

C PRACTICAL IMPLEMENTATION

Students should be able to:

- plan and organise the procedure to implement a design proposal;
- undertake safely and efficiently the practical work to implement a design;
- demonstrate refined making skills and the capacity to attend to fine detail;
- test and evaluate the product leading to proposals for improvement.

SPECIFICATION GRID

Component	Assessment Objectives			Total
	A Knowledge and Understanding	B Design Analysis, idea generation and synthesis	C Practical implementation	
1	15%	15%	-	30%
2	-	13%	7%	20%
3	15%	15%	-	30%
4	-	5%	15%	20%
Overall	30%	48%	22%	100%

The assessment objectives are weighted to give an indication of their relative importance. They are not intended to provide a precise statement of the number of marks allocated to particular assessment objectives.

ASSESSMENT

SCHEME OF ASSESSMENT

Candidates following an Advanced Subsidiary course will be examined by means of Components 1 and 2 and those following a full GCE A Level course will be required to take Components 1, 2, 3 and 4.

Component 1	Written	3 hours	30%
Component 2	Project	40-50 hours	20%
Component 3	Written	3 hours	30%
Component 4	Project	40-50 hours	20%

DESCRIPTION OF COMPONENTS

Component 1 will test knowledge, understanding, product analysis and design, and will contain three sections.

Section A will consist of **three** structured Core knowledge application questions from which candidates will answer one question.

Section B will contain **three** product analysis questions, based on the Core specification, from which candidates will be required to answer one question.

Section C will consist of **three** design questions, based on the Core specification, of which candidates will be required to answer one. These questions will be appropriately structured for AS level.

Component 2 will allow candidates to investigate and develop specialist areas of interest through a Coursework Project. The Project will be based on a self-determined design problem and will result in the production of a design model.

The purpose of the model is to establish the validity of the initial design thinking and synthesis of ideas and their suitability for further development.

Depending on the nature of the project, it is likely that the model will either focus on one or more detailed aspects of design ideas and proposals or represent an overall design idea through a scale model.

The model must consist of a made product formed from one or a combination of kit, resistant or semi-resistant materials.

Computer modelling is not suitable for this section of the project and the outcome is likely to be 3D in nature, although 2D models may be appropriate for certain graphic products. Candidates may use materials outside those specified in the curriculum content (e.g. textiles) but it must be possible to assess the outcome using the coursework assessment criteria in the syllabus. No allowance can be made for the use of other materials and candidates will still need to prepare for and respond to the written paper(s) based on the specified curriculum content.

Component 3 will test design, knowledge and understanding in the three focus areas and will contain two sections.

Candidates will have the opportunity to specialise in one focus area.

Section A will contain nine structured knowledge application questions covering the three focus areas. Candidates will be required to answer two questions from **one** focus area.

Section B will consist of three design questions, covering the three focus areas, from which candidates will be required to answer one.

Component 4 can be either the natural development of the project produced for Component 2 or a completely new project covering Components 2 and 4 in a holistic way. The outcome of this component will be a product made in the most appropriate materials available. This may take the form of the complete final product, a prototype or camera ready copy, depending on the nature of the intended solution. However, it must be possible to test and evaluate the product in a meaningful way.

Components 2 and 4 will each be assessed by the teacher(s) in the Centre, using the Coursework assessment criteria in this syllabus.

As a sample of the coursework projects will need to be despatched to CIE for moderation purposes, the design folio should be in paper format no larger than A3 size. Each folio should include sufficient photographs showing an overall view and detailed evidence of the level of achievement reached on the model and/or final product. On no account should Centres attempt to send 3D products to CIE for moderation purposes.

Detailed instructions for the moderation of Coursework will be sent to Centres after final entries have been received.

Although one of the syllabus Aims is to encourage the use of information and communications technology (ICT), this is not a requirement of the assessment scheme and candidates will not be penalised where it is not used.

CURRICULUM CONTENT

The Curriculum content is set out in two parts:

PART 1 CORE
PART 2 FOCUS AREAS

All candidates are to follow the **Part 1 Core**. Those taking the A level qualification select **one** of the three alternatives from **Part 2** of the **Curriculum Content**.

A
Product Design

B
Practical Technology

C
Graphic Products

PART 1 CORE

Candidates should be able to:

Situation	recognise problems which can potentially be solved through practical design activity; prepare a design brief that accurately describes the need/s;
Research	locate, gather and order information and data relevant to the solution;
Specification	form analysis of the situation; draw up a comprehensive, succinct and detailed specification of requirements;
Concepts	generate and record possible solutions; appraise possible solutions through a variety of techniques leading to the selection of one idea for development;
Modelling	model detailed aspects of ideas and proposals using appropriate practical techniques;
Development	develop and formulate a detailed design proposal for production of the final product; identify the resources needed for realisation of a solution;
Implementation	organise the resources for realising the product; make the product through the skilful use of appropriate hand and machine tools and other equipment; work at all times with regard to mandatory and other necessary safety measures and with proper concern for the efficient use of materials, energy and other resources;
Testing and Evaluation	devise and apply appropriate tests to assess the success of the product against original needs and others which have emerged and been absorbed into the design; suggest possible improvements for the product;

Design and Technology in Society	<p>recognise rational and intuitive approaches to design; show awareness and appreciation of the issues of conservation of resources, built in obsolescence and the role of recycling; demonstrate an appreciation of the significant positive and negative effects of design upon society; show awareness of the differences between individual, small batch and mass production and how each affects the means of production, the product and the people involved;</p>
Aesthetics	<p>use line, colour, shape, proportion and form to achieve desired effects; show appreciation of the effects of light and shade on solid forms and the effects of different surface finishes on visual and tactile senses; demonstrate aesthetic sensibility through meaningful use of appropriate vocabulary such as – harmony, conflict, static and dynamic; appreciate the significance of style and the influence of fashion and design;</p>
Ergonomics	<p>understand the significance of ergonomics in design; interpret and apply anthropometric data;</p>
Energy	<p>identify and compare the main sources of energy using finite supplies, such as fossil fuels, and regenerative forms such as water, wind and solar; describe the different forms of energy storage in use to include: kinetic, potential, thermal, electrical and chemical; describe practical and efficient methods of conversion and transmission through simple mechanisms, machines, engines, turbines and electric motors;</p>
Control	<p>explain basic principles of manual and semi-automatic and automatic control using input, output, feed-back and amplification; appreciate the principles employed in CAD (computer aided design) and CAM (computer aided manufacture);</p>
Materials	<p>appreciate the significance of the properties: hardness, ductility, toughness, brittleness, elasticity, dimensional stability, electrical conductivity, corrosion resistance; explain the considerations required in the selection of materials and components to ensure suitability for purpose; explain and compare, through the use of examples, the terms destructive and non destructive testing of materials; demonstrate a general knowledge of wood, manufactured boards, metals, plastics, paper and card, being able to select them for appropriate use according to their characteristics, properties and performance;</p>
Materials Processing	<p>mark and set out with reference to data using tools and methods appropriate to the materials and required accuracy; cut, shape and form materials using methods appropriate to the task; join and assemble using a range of common methods including temporary and permanent fixings; apply a finish appropriate to the material and its use, distinguishing between decoration and protection;</p>
Product Analysis	<p>analyse existing products in terms of: function; aesthetics; ergonomics; types and properties of materials; production techniques; safety;</p>

Health and Safety

be aware of standard risk assessment procedures in product design and manufacture;
understand safe working practices, including identifying hazards and making risk assessments.

PART 2 FOCUS AREAS

Students are to follow **one** of the sections **A**, **B** or **C**

Wherever possible, the objectives should be met through practical manipulative experience.

A Product Design B Practical Technology C Graphic Products

A PRODUCT DESIGN

Candidates should be able to:

Design Stimulus and Methodology	<p>show appreciation of the concepts market-pull and producer-led design; explain how advances in technology impact upon the evolution of design; demonstrate an understanding of the need of designers to consider physical, cultural and aesthetic needs; discuss aspects of the man-made environment as shaped by product designers, designer craftsmen and engineers; show appreciation of the economic implications of design decision making;</p>
Production	<p>describe the principles of unit and mass production; recognise the influence of industrial production methods upon the design of products;</p>
Modelling	<p>understand the role of different forms of modelling; describe a range of methods of 2D and 3D modelling: kits, computers, mock-ups and scale prototypes;</p>
Metal Properties	<p>describe the physical characteristics, working properties and typical applications of:</p> <ul style="list-style-type: none"> ferrous – iron, mild steel, carbon steel, high carbon steel; non-ferrous- copper, aluminium, zinc, lead, tin; composite alloys – stainless steel, bronze, brass and duralumin (or similar);
Processing	<p>describe how to use heat treatment to anneal, harden and temper, and case harden; appreciate the cause and effect of work hardening; explain the process of casting using simple and split patterns; describe the process and explain the use of die-casting; describe the principles of producing forms by rolling, drawing and extruding; shape by:</p> <ul style="list-style-type: none"> deforming and reforming using bending and pressing; wastage by hand cutting and shearing; wastage by machine methods including drilling, turning using independent and self centring chucks, end milling for flat surfaces and rebates; <p>join materials using soft and hard soldering, brazing, rivets, threaded fixings; understand the use of gas and electric arc welding; compare the use of a range of surface finishes including painting, polishing, plating, dip coating, enamelling, etching and anodising;</p>
Tool Technology	<p>understand the cutting action of lathe, end milling, drilling, sawing and hand cutting tools; describe the maintenance of cutting edges of simple lathe tools, drills and hand-cutting tools;</p>

<p>Wood Properties</p>	<p>describe the physical characteristics, working properties and typical applications of hardwood and softwood; explain the reasons for and describe in outline natural and kiln seasoning; describe and appreciate the significance of warping, twisting and dimensional stability; appreciate the nature and describe the use of veneer; describe the general nature of, and give typical applications for, the following processed boards: blockboard, plywood, chipboard, hardboard, medium density fibre board;</p>
<p>Processing</p>	<p>prepare, mark and set out using datums; shape, to form straight and curved profiles using a range of hand tools; turn on a lathe using face plate and between centre turning techniques; use a range of boring tools including the drilling machine; describe the use of fences as guides on machines; describe the moulding of simple forms by hand and machine methods; produce surfaces appropriate for a variety of finishes; produce finishes using varnish, paint, oil; assemble and join using a range of frame and carcass (box) constructions; use temporary and permanent fixings including screws, adhesives, nails, wedges and dowels; describe the process of laminating and explain its significance in terms of strength and form;</p>
<p>Tool Technology</p>	<p>describe the maintenance of hand tool cutting edges; understand cutting action of sawing, planing and boring hand tools;</p>
<p>Plastic Properties</p>	<p>explain the difference between thermoset and thermoplastic materials; describe the working characteristics and properties of the following thermoset plastics and give typical applications: polyester resin, epoxy resin, melamine; describe the working characteristics and properties of the following thermoplastics and give typical applications: acrylic, polythene, nylon, PVC, polystyrene, ABS and polypropylene; describe the techniques and effects of using glass and carbon fibres as reinforcement;</p>
<p>Processing</p>	<p>understand the working principles and make judgements regarding their selection and application of calendering, injection moulding, compression moulding, rotational moulding and vacuum forming; shape by hand tools, drilling and turning using a lathe; join with adhesives, solvents and mechanical methods such as screw threads and the use of fixings; describe how to produce and protect polished surfaces;</p>
<p>Tool Technology</p>	<p>describe the maintenance of hand and machine tool cutting edges; understand cutting actions of drills, lathe tools and hand tools.</p>

B PRACTICAL TECHNOLOGY

Candidates should be able to:

Technological Design and Production	<p>explain how technological developments can affect the design and manufacture of artefacts;</p> <p>understand the terms invention, innovation and evolution;</p> <p>describe the use of CAD (computer aided design) for the storage and retrieval of data and the manipulation of images to aid design, production and management;</p> <p>describe the principal features of CAM (computer aided manufacture) particularly in the control of machines;</p>
Materials	<p>appreciate the significance of the following properties with regard to materials, components and artefacts:</p> <p>electrical and thermal conductivity, corrosion resistance, toughness, ductility, elasticity, plasticity, brittleness;</p> <p>identify, with reasons, appropriate applications of:</p> <p>timber, concrete, mild steel, carbon steel, copper, brass, lead, aluminium, thermoplastic and thermoset plastics, rubber, semi conductors;</p> <p>explain the terms:</p> <p>alloying, reinforcement.</p> <p>conduct simple experiments to:</p> <p>determine the relationship between extension and load;</p> <p>compare relative hardness, stiffness and tensile strength;</p> <p>understand Young's Modulus of elasticity, draw a stress/strain graph from given data, and interpret significant features;</p>
Processing	<p>understand the working principles and make judgements regarding the selection and application of metal and plastic casting, injection moulding, compression moulding, vacuum forming, laminating, machining on the lathe;</p> <p>show awareness of die casting, drawing, extruding, blow moulding, rotational moulding; understand the use and application of soft and hard soldering, electric and gas welding, adhesives;</p>
Mechanisms	<p>explain the terms load, effort, mechanical advantage, velocity ratio and efficiency; explain the principles of levers and calculate moments;</p> <p>describe methods of:</p> <p>converting linear to rotary motion and vice versa including the use of cams, cranks and ratchets;</p> <p>transmitting linear and rotary motion;</p> <p>calculate driver/driven ratios including compound trains; explain the role of friction and lubrication;</p> <p>explain the principles and compare hydraulic and pneumatic systems for linear motion;</p>

Structures	<p>Compare and comment on frame and monocoque structures in existing common applications such as buildings, bridges, cranes, furniture, vehicles, machines and the occurrence of structural features in nature; understand how structures can be reinforced through the use of gussets, ribs, braces and lamination; identify struts and ties in frameworks and recognise where and how triangulation can be used to establish rigidity; apply the concept of equilibrium as a result of applied load and reaction; solve design problems using vector diagrams involving two inclined forces or three forces in equilibrium; apply Bow's notation to assist the resolution of a framework by graphical means;</p>
Structural Failure	<p>identify and comment on modes of potential failure in structures and machines including: plastic hinging, buckling, twisting, changes in temperature and fatigue;</p>
Testing	<p>be aware of appropriate methods of non-destructive testing, including strain gauges and photoelasticity; understand and apply simple data from tensile, compressive, shear, bending, torsion and impact tests in design situations;</p>
Power Sources	<p>describe the characteristics of AC and DC current; understand the principles of step down/up, rectification, voltage and current regulation; apply Ohm's Law; determine power from known current and voltage; use meters to measure voltage, current and resistance;</p>
Electronics and Control	<p>explain the working of the following: switches including reed, micro switch and relay; transistors (NPN and PNP types) as amplifier and switch and define current gain; a Darlington Pair; capacitors; diodes for rectification and protection against back emf; zeners for voltage reference; LEDs and photodiodes; resistors including stability, tolerance and power rating; transducers including thermistors, strain gauges and LDRs; calculate resistance of series and parallel resistors; determine the values for resistors for a potential divider;</p>
Circuits	<p>draw circuit diagrams including: switching using the output from op amp to operate transistors and relays. Operational amplifiers based on 741 or similar IC; time delay using an IC such as a 555; explain the functions of AND, OR, NAND, NOR and XOR; construct truth tables for the above functions; show how two NAND or two NOT gates can be cross coupled to produce a flip-flop; be aware of the differences between the TTL and CMOS series of ICs; draw monostable circuits using logic gates and/or 555 timers; describe how to use a Schmitt trigger for inputting from a sensor, be aware of the functioning of a digital-analogue converter, understand the principles of interfacing between a computer and input and output devices.</p>

C GRAPHIC PRODUCTS

Candidates should be able to:

Design Influences and Methodology	<p>explain the concepts of market-pull and producer-led design; explain how advances in technology impact upon the evolution of designs; understand and demonstrate the influences of style and fashion upon design; demonstrate an understanding of the need of designers to consider physical, cultural and aesthetic needs; discuss aspects of the man-made environment as shaped by product designers, designer craftsmen and engineers; show appreciation of the economic implications of design decision making; demonstrate a general understanding of production techniques and marketing methods used in the commercial world; describe and identify current good practice in the use of CAD equipment, recognising the advantages of accuracy, ease of storage/retrieval, ease of modifying drawings, the production of many originals and the integration of data for costing, stock control and production via links with CNC machines; use a range of drawing conventions, including engineering, electrical and architectural;</p>
Recording Information	<p>use a range of techniques to record and manipulate information, ideas and processes including free-hand sketching, annotation, bar and pie charts, 2D and 3D charts, graphs, tables, flow charts, pictograms and ideograms; analyse data and other information to explore concepts and ideas;</p>
Modelling and Testing	<p>construct two and three dimensional models to explore, test and appraise ideas; use materials, processes and equipment appropriate to the subject to produce refined models to communicate concepts and ideas;</p>
Drawing Systems	<p>select and use formal and free-hand drawing techniques appropriate to the subject including: assembled, exploded and cut-away; orthographic in first and third angle projection; dimensioning; isometric using ellipse templates and approximate constructions for circles and arcs; planometric using 45/45; perspective using one and two point;</p>
Presentation	<p>demonstrate the ability to enhance the visual impact of an illustration by the use of thick and thin line techniques, tone, colour, shadows, reflections and material representation; demonstrate knowledge of a range of methods for the display and exhibition of information and artefacts, including mounting, break down of space, focal points, circulation of viewers; show understanding of the production and manipulation of images using appropriate reprographic techniques, display stands and representational models;</p>
Geometry	<p>use loci to determine the path of movement of linkages; determine the development (net) of basic geometric forms including prisms, cylinders, pyramids, cones and their frustums; determine the interpenetration of solids including prisms, cylinders, pyramids, cones and their frustums;</p>

Mechanisms

describe methods for transmitting and converting linear and rotary motion including cranks, ratchets and simple cams;
construct accurately a cam profile from given data and draw its displacement diagram;

Materials

demonstrate a general knowledge of the characteristics of card, paper and other modelling materials;
understand the principles and describe the common forms of processing the above materials including forming, fabricating, shaping, joining and finishing;
demonstrate a general knowledge of wood, metals, plastics, concrete, brick, fabrics, glass and ceramics, being able to select them for appropriate use according to their characteristics, properties and performance;
be aware of forms in which materials are supplied and their approximate relative costs.

COURSEWORK PROJECT ASSESSMENT

The Coursework projects produced for Component 2 and Component 4 will be internally marked using the following assessment headings.

Detailed criteria are set out in the pages that follow.

			Maximum Mark	Total
Component 2	1	Identification of a need or opportunity leading to a Design Brief.	3	
	2	Analysis of and research into the Design Brief which results in a Specification	7	
	3	Generation and appraisal of Design Ideas.	16	
	4	Modelling of Ideas.	14	40
Component 4	5	Product Development.	10	
	6	Product Planning	4	
	7	Product Realisation.	20	
	8	Testing and Evaluation.	6	40
				80

Depending on the nature of the work produced, the project(s) will be assessed either as two separate Components or as a combination of the two Components.

The weighting of the above marks should give some indication of the approximate amount of time spent on each part of the project.

It is intended that each Component should represent approximately 40/50 hours of work. Most of this should be under the direct supervision of the teacher, although it is accepted that some of the work, by its very nature, may be undertaken outside school, e.g. research, testing etc.

For assessment purposes, the criteria that follow have been written in a linear form, although it is expected that some of the work will be cyclical in approach and some stages may interrelate.

Internal Moderation

When more than one teacher in a Centre is involved in internal assessment, arrangements must be made within the Centre for all candidates to be assessed to a common standard.

External Moderation

Coursework marks will be subject to external moderation by CIE.

As a sample of projects will need to be despatched to CIE for this purpose, the design folios should be in paper format no larger than A3 size. Each folio should include sufficient photographs showing an overall view and detailed evidence of the level of achievement reached on the model and/or final product.

On no account should Centres attempt to send 3D models or products to CIE for moderation purposes.

General instructions for the moderation of Coursework can be found in the Handbook for Centres. Please note that candidates are not able to carry forward coursework marks to future sessions.

Detailed instructions for the moderation of Coursework will be sent to Centres after final entries have been received by CIE.

COURSEWORK ASSESSMENT CRITERIA

CRITERION	LEVEL OF RESPONSE	MARK RANGE
1. Identification of a need or opportunity leading to a Design Brief.	Some consideration of the situation or the intended user leading to a design brief.	1
	Consideration of both the situation and the intended user leading to a clear design brief.	2
	Detailed description of both the situation and user leading to a clear and precise design brief.	3

CRITERION	LEVEL OF RESPONSE	MARK RANGE
2. Analysis of and research into the Design Brief which results in a Specification	Intended use of product examined with some data identified or collected. Existing products identified with some evaluation.	1-2
	Intended use of product examined with data identified and collected. Existing products identified and evaluated considering some of the needs of the intended user/users. A detailed specification produced.	3-5
	Intended use of product fully examined with relevant data identified and collected. Existing products identified and fully evaluated against the needs of the intended user/users. Analysis of the research leading to a detailed design specification.	6-7

CRITERION	LEVEL OF RESPONSE	MARK RANGE
3. Generation and appraisal of design ideas	A limited range of ideas proposed. A cursory appraisal of ideas. Unsupported choice of design ideas for development. Several aspects of the specification not considered.	1-5
	A range of appropriate ideas proposed. The choice of ideas for development supported by clear appraisal. Most aspects of the specifications highlighted.	6-11
	A wide range of appropriate ideas proposed. Design proposal chosen as a result of detailed appraisal and consideration of the need and fitness for purpose. All aspects of the specification considered in detail.	12-16

CRITERION	LEVEL OF RESPONSE	MARK RANGE
4. Modelling of Ideas	Quality of product marred by limited skills and inappropriate use of materials.	1-4
	Competency shown in most aspects of applying skills. Good choice of materials.	5-9
	Mastery of a wide range of materials. Attention to detail with sound application of materials technology.	10-14

CRITERION	LEVEL OF RESPONSE	MARK RANGE
5. Product Development	As a result of investigations some decisions made about form, materials and production methods. Some reference to the model. Some important details given about the final solution.	1-3
	Some testing and trialling resulting in decisions about materials, production methods and other items. Reference to modelling to ensure that the product meets the design brief. Most details given about a final solution and its relevant system of manufacture.	4-7
	Appropriate testing and trialling resulting in reasoned decisions about form, materials, production methods and other items. Has used the model to identify and make necessary modifications and to ensure the product meets the design brief. Full details about the final solution and the production methods.	8-10

CRITERION	LEVEL OF RESPONSE	MARK RANGE
6. Product Planning	Planning will have been restricted to the immediate task and will have relied on prompting. Drawings and information briefly satisfy requirements for making the product.	1
	Most of the realisation will have been planned in advance. Drawings and other details provide all information for making the product.	2-3
	The realisation will have been thoroughly planned to specify an effective order for the sequence of operations. Refined drawings and other detailed information show thorough command of related knowledge.	4

CRITERION	LEVEL OF RESPONSE	MARK RANGE
7. Product Realisation	Has overcome problems as they arise using appropriate materials, tools and equipment. With some guidance has used a range of skills and techniques appropriate to the task. Reasonable understanding of safe working procedures. The product will exhibit a reasonable standard of outcome, be mainly complete and will satisfy the specification with a limited degree of success.	1-6
	Has made economic and efficient use of materials, tools and equipment modifying the application of these if appropriate. With a normal level of supervision, has combined a range of skills and techniques appropriate to the task. Good understanding of safe working procedures. The product will exhibit a good standard of outcome, will be complete and will function as intended.	7-14
	Resourceful and adaptable with materials, tools and equipment. Has independently combined a range of skills and techniques appropriate to the task. High understanding of safe working procedures. The product will be completed to a high standard of outcome and will meet the detailed requirements of the design specification.	15-20

CRITERION	LEVEL OF RESPONSE	MARK RANGE
8. Testing and Evaluation	Superficial testing with a few conclusions. Some supported comment with reference to the original specification and use of resources.	1-2
	Relevant testing with conclusions, leading to possible modification or improvement of product. Relevant comments with reference to initial specification and use of resources.	3-4
	Detailed testing with meaningful conclusions. Critical evaluation related to initial specification and use of resources. Proposals for further development, modification or improvements of product.	5-6

A. INSTRUCTIONS FOR COMPLETING COURSEWORK ASSESSMENT SUMMARY FORMS

1. Complete the information at the head of the form.
2. List the candidates in an order which will allow ease of transfer of information to a computer-printed Coursework mark sheet at a later stage (i.e. in candidate index number order, where this is known).
3. Enter each candidate's marks on this form as follows:
 - a) In the individual skills columns, enter the marks awarded.
 - b) In the column headed 'Total Mark', enter the total mark awarded.
4. Ensure that the addition of marks is independently checked.
5. Both the teacher completing this form and the internal moderator should check the form and complete the bottom portion.

B. PROCEDURES FOR EXTERNAL MODERATION

1. University of Cambridge International Examinations (CIE) sends a computer-printed Coursework mark sheet to each centre showing the name and index number of each candidate. Transfer the total internally moderated mark for each candidate from this Coursework Assessment Summary form to the computer-printed Coursework mark sheet.
2. Despatch the top copy of the computer-printed Coursework mark sheet (MS1) to the Ministry or CIE, as appropriate in time to allow external moderation to take place. The deadline for receipt of this completed document is 31 October for the November examination.
3. Send samples of the candidates' work covering the full ability range, together with this form and the second copy of MS1, by 31 October for the November examination.
4. If there are 10 or fewer candidates submitting Coursework, send all the Coursework that contributed to the final mark for every candidate.
5. If there are more than 10 candidates, send the Coursework that contributed to the final mark for the number of candidates as follows. The marks of the candidates' work selected should cover the whole mark range with marks spaced as evenly as possible from the top mark to the lowest mark.

number of candidates entered	number of candidates whose work is required
11-50	10
51-100	15
above 100	20

6. If different teachers have prepared classes, select the samples from the classes of different teachers.
7. CIE reserves the right to ask for further samples of Coursework.