

GCSE

Edexcel GCSE

Design & Technology

Resistant Materials Technology (1973, 3973)

This Examiners' Report relates to Mark Scheme
Publication code: UG 016441

Summer 2005

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Examiners' Report

Edexcel GCSE
Design & Technology
Resistant Materials Technology (1973, 3973)

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Summer 2005

Publications Code UG 016441

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Index

GCSE Design and Technology: Resistant Materials Technology Examiners' Reports

Unit 1973 Full Course Foundation Tier (2F).....	5
Higher Tier (2H)	9
Coursework (01)	13
Unit 3973 Short Course Foundation Tier (2F)	21
Higher Tier (2H)	25
Coursework (01).....	27
Grade Boundaries, Full Course	33
Grade Boundaries, Short Course	35

**GCSE Design and Technology: Resistant Materials Technology
Principal Examiner's Report
Unit 1973, Foundation Tier**

General Comments

This is the third year that this specification has been examined. The specification tests candidates' knowledge and understanding of resistant materials and products, processes and the effects of producing and using them on society and the environment. The written paper tests their application of this knowledge and understanding through their responses to questions about products and the processes involved in their manufacture, both in school and as part of large quantity production.

It was evident that the candidates' knowledge of processes was lacking in depth and sufficient detail. Centres must be advised that candidates should be prepared for this examination using the specification as a guide. It is not sufficient to rely upon and assume that candidates will gain sufficient knowledge and understanding through practical designing and making in their coursework.

Most candidates performed reasonably well where questions were targeted at school workshop production but where commercially produced products were introduced candidates showed limited knowledge. Their knowledge of commercial processes was generally lacking and as a result candidates' responses were limited. Where questions asked for an explanation or description candidates could give a reason but lost the second mark because they did not justify or qualify their answers. Centres should also be reminded that candidates must write on the paper in ink rather than pencil and that no correction fluid or pens should be used. It was also more notable this year that some candidates are writing unsuitable and inappropriate comments about their teachers and the exam in general. This must be discouraged as it can be, and in some cases, it is very offensive. Candidates must also be encouraged to use only the space provided for their responses. Again it was more significant this year to see a number of responses running across both pages, through into the margins or design question responses drawn on another part of the paper.

Foundation Tier (2F)

Most candidates showed a limited range of experience throughout the paper and as a result could score some marks across the paper. There were some obvious areas of knowledge of materials and processes that were not covered by some centres which penalised their candidates. This was evident even in the first question which highlighted a limited knowledge of basic tools and their uses.

It must be stressed to candidates that the question needs to be read carefully in order to score marks, without wasting too much time on responses that do not score marks. Centres also need to make candidates aware that the number of marks available for responses is shown in brackets at the end of each part question. Notice should also be taken of the information in the Teacher's Guide (pages 11 to 15) that gives clear guidance as to the distinct meaning of the wording and word hierarchy used in questions for this examination ie give/state/name/describe/explain. This should form part of teaching practice to students in preparation for this paper. It is obvious from the types of responses given by candidates that some Centres did not cover some parts of the specification.

Question 1

Q1(a)(i) and Q1(a)(ii) This section was slightly better answered in comparison to last year with most candidates able to name some of the tools shown and they were able to describe their use. However, knowledge of tools and related processes remains generally weak. Very few candidates were able to correctly name the die and describe its use and there were few correct answers for the G-cramp. Many candidates need to be more specific in the description of the use of the tools. Too often, responses were deemed to be too generic 'clamping' or 'screwing'.

Q1(b)(i) The majority of candidates correctly identified 'Tray 2' as being the tray which makes most efficient use of the material.

Q1(b)(ii) The majority of candidates correctly identified the waste material.

Q1(c)(i) A well answered question with most candidates able to name the 'type of corner joint'.

Q1(c)(ii) Few candidates were able to correctly name two corner joints but most managed one with the most popular answers being, finger, mitre and dovetail joint.

Q1(d) Few candidates were able to answer all three parts correctly and it would appear that candidates did not read the question properly and guessed at the responses.

Q1(e) Many candidates responded with one word answers or made generic statements about CAM as opposed to 'how CAM can enable faster and more flexible manufacturing'. There were rarely any fully linked answers for the two full marks.

Question 2

Q2(a) A good number of candidates were able to correctly identify ABS from the list of plastics.

Q2(b)(i) Generally the properties of materials were not fully understood. Most candidates were able only to identify one property of plastic.

Q2(b)(ii) 'Plasticity' was poorly understood with most candidates only able to offer one reason why the plastic must have this property. The more general answers related to the plastic needing to become a liquid.

Q2(c) Another poorly answered question about the properties of materials. Most candidates however were able to offer at least one property, that being 'electrical conductor'.

Q2(d) A surprisingly poor level of response with a large number of candidates unable to explain why the copper wire was coated with a plastic material. The most common answers were linked to 'insulation' and 'electrocution' but the majority failed to go on and fully explain the reason.

Q2(e) Almost no candidates gained all three marks, but most understood 'fewer workers' for one mark. It was noticeable that some centres had taught this section of the specification very well indeed.

Q2(f) Most candidates could easily give two correct responses but the rest of the responses were generally repeats of those already given. In general though a wide range of responses were supplied.

Q2(g) Most candidates were only able to provide answers relating to 'less pollution' or 'fewer raw materials needed'. Very few linked responses explaining answers which allow the candidates full access to the range of marks available.

Question 3

(a) Few candidates answered this question really well and poor illustrations were common place. Although there were some good ideas presented for idea 1, the second idea tended to be weak indicating a lack of design capability. The dimensions were not used by many candidates to indicate the size and proportion of their design work. On the whole, most candidates were able to make proposals which responded to the first three sets of specification points but the majority of candidates failed to address the final point regarding the product being made as a one-off. Candidates must be prepared to make an indication of the tools, processes and materials which would be used in the production of their proposed solution. Some candidates simply repeated Design Idea 1 for Design Idea 2 but drawn better after the practise. Candidates must also be prepared to offer two technically and conceptually different design ideas.

Candidates must be prepared more rigorously for this part of the examination.

(b) Some evaluations were not completed or attempted by candidates. However for the majority, candidates had little difficulty in describing one positive or negative aspect of their design. At best, candidates fully justified how their chosen design had either succeeded or failed to meet both points within each specification point. At worst, candidates repeated simple statements from their annotation or just repeated the specification point itself, 'My book stand is easily cleaned'.

Question 4

Q4(a) A number of candidates were able to offer additional specification points for safety but the level of response in relation to 'performance' and 'function' were on the whole poor. Too many responses were too vague 'it must work properly' or 'it will not sell if it does not do what it says'. Some candidates simply repeated the specification points given and subsequently scored no marks.

Q4(b) Generally a poor level of response about the property of hardness and the suitability of silver steel for the knife blade. Most incorrect responses referred to the fact that the knife blade would not break in use.

Q4(c) Good numbers of candidates were able to respond with answers showing an understanding of 'less money tied up in machinery'. However, too many vague and generic responses were observed relating to it being cheaper, quicker and the fact that they did not have to buy materials.

Q4(d) The majority of questions did not answer this question well with only one mark being scored for 'rotating/swivelling' or 'easy way to secure the tools'. Very few responses were fully explained allowing all the marks to be fully accessed.

Q4(e)(i) The majority of candidates were able to give one correct response. Most related to the ease of folding, but too many responses were too vague, eg 'it should do what it is supposed to do'

Q4(e)(ii) Not a well answered question. A good number of candidates failed to understand that this test was related to 'one check that was to be carried out on the jaws of the multi-tool.' Most correct answers were related to 'no rough edges'.

Q4(f)(i)(ii) The majority of candidates were able to 'state' rather than 'explain' how the multi-tool achieved its purpose. This therefore meant that only half marks could be scored on this part of the question.

GCSE Design and Technology: Resistant Materials Technology
Principal Examiner's Report
Unit 1973, Higher Tier

Higher Tier 2H

It was evident that centres had entered candidates correctly for this tier of the examination. A greater number of candidates showed a greater understanding of what the key words in questions were asking of them ie describe/explain. Notice should be taken however of the information in the Teacher's Guide (pages 11 to 15) that gives clear guidance as to the distinct and specific meanings of words and their hierarchy used in questions in this examination. This should form part of teaching practice to students in preparation for this paper. It is obvious from the types of responses given by candidates that some centres did not cover some parts of the specification.

Question 1

This is an overlap question between the two tiers.

Q1(a) Most responses to this question scored well for the safety point and reason with very few candidates fully understanding the difference between performance and function. Very common wrong answers referred to being able to cut or being hard enough to cut through hard materials. A lot of responses were simply repeats of those already given in the stem of the question.

Q1(b) Generally a poor level of response about the property of hardness and the suitability of silver steel for the knife blade. Most incorrect responses referred to the fact that the knife blade would not break in use or that it was strong.

Q1(c) Good numbers of candidates were able to respond with answers showing an understanding of 'less money tied up in machinery'. However, too many vague and generic responses were observed relating to it being cheaper, quicker and the fact that they did not have to buy materials.

Q1(d) The majority of questions did not answer this question well with only one mark being scored for 'rotating/swivelling' or 'easy way to secure the tools'. Very few responses were fully explained allowing all the marks to be fully accessed.

Q1(e)(i) The majority of candidates were able to give one correct response. Most related to the ease of folding, but too many responses were too vague, 'it should do what it is supposed to do'

Q4(e)(ii) Not a well answered question. A good number of candidates failed to understand that this test was related to 'one check that was to be carried out on the jaws of the multi-tool.' Most correct answers were related to 'no rough edges' but very few candidates went on to fully describe their answers.

Q1(f)(i)(ii) The majority of candidates were able to 'state' rather than 'explain' how the multi-tool achieved its purpose. This therefore meant that only half marks could be scored on this part of the question.

Question 2

Q2(a) There were a range of different responses here which scored full marks for many candidates. Most scoring less than full marks scored at least one mark for giving potential hazards to eyes and the need to wear goggles.

Q2(b) There were very few candidates scoring more than one or at most two marks by completing the table. Most scored a mark for sanding the shape before applying varnish and a small number scored a mark for turning the profile. A third common mark was for giving some reference that the blank needed the corners taking off to make an octagon. On the whole this question was very poorly completed.

Q2(c) Most knew that varnish protects or enhances the finished product but only a few scored the full two marks by justifying their answer to this question.

Q2(d) Generally most candidates scored one mark for each of the two responses required but here too they failed to explain their answers. The most common answers were the ability to meet the need, flexibility in production and the ability to change and modify the design to improve it for customers.

Q2(e) This question scored well as there were many acceptable answers, the most common was e-mail though many also gave Internet.

Q2(f) Here too there were many and varied answers though candidates only scored one mark for each response as they failed to expand their answer to describe how e-mail might be used to speed communication. There were numerous responses giving CAD/CAM, which did not score marks unless it described the possibility that CAD files can be quickly converted to CAM files for machining.

Question 3

(a) Once again there were many imaginative responses to this design question. Most scored at least half marks for their first design but often failed to read the question, which asked for “two different” designs. This was evident in many ways from showing two designs with 2 x 2 bottle arrangement instead of 2 x 2 and 4 x 1 or having similar handles or similar indicators. A large number added a possible material to their design but hardly any considered how it would be produced in batches by mentioning jigs, formers or other suitable processes. Candidates must also be prepared to offer two technically and conceptually different design ideas.

Candidates must be prepared more rigorously for this part of the examination.

(b) Most candidates showed good evaluation skills and scored full marks by adding further information. Single marks were awarded for comments that were not justified.

Question 4

Q4(a) Two properties was the most that the majority of candidates gave, usually relating to durability and the ability to mould. Many candidates showed limited knowledge of thermoplastics with guesses about low melting points and malleability.

Q4(b) The differences between the two classifications of plastic were reasonably well answered. Many candidates scored two marks for ‘thermoplastics can be remoulded whereas thermosets are one-shot’. Some centres had covered the structure of plastics and candidates showed this with good descriptions.

Q4(c) The addition of texture to the bottle scored half marks for most candidates in a number of alternate ways. Many identified the cap and grip and others the Braille information and gave a suitable amplification. The ability to incorporate the moulding in manufacture was also a common answer.

Q4(d) Generally well answered with most candidates scoring full marks for identifying the advantages of the material and giving a suitable advantage of its use.

Q4(e) Candidates commonly scored two of the three marks, identifying safety and quality control as the main benefits.

Q4(f) Very few candidates appreciated that the question required benefits of CAD/CAM to the consumer and so scored few marks. Most candidates scoring marks gave accuracy in production.

**GCSE Design and Technology: Resistant Materials Technology
Principal Moderator's Report
Unit 1973, Coursework**

General Comments

This year, moderators report that responses to coursework from centres have demonstrated a similar pattern to those of last year. The levels of response of the best work seen has been outstanding, where the quality of work far exceeds the requirements of Edexcel's specification for Resistant Materials Technology in both designing and complexity of practical outcome.

There were further indications that successful centres were acting upon INSET advice or responding to last year's Principal Moderator's report, because they responded well to the 'technicalities' of the assessment criteria and were able to target dedicated single marks. For example those assigned to identifying a target market in 'Needs', justifying budgetary constraints in 'Specification', considering the safety of others in 'Work safely' and others.

Most coursework tasks were potentially appropriate to coursework requirements, allowing candidates the opportunity to target the full range of marks available. The majority of centres are now good at presenting evidence of candidates' work through well organised design folios that use clear page numbering, section headings that identify assessment criteria and content that is selective and focused on quality rather than quantity. Almost all centres used Edexcel's guideline on the number of pages that should be included in a design portfolio and were able to complete their work within 15 - 20 A3 sheets.

A minority of centres presented work that was disorganised, packaged inappropriately with sharp metal fasteners in heavy folders that were difficult to handle, but this has been much less of a problem this year.

The quality and range of photographs presented to support marks awarded by centres continues to improve and this aspect of candidates' work has become an essential tool in helping moderators agree centre marks in assessment areas such as 'Select and Use', 'Make Products' and 'Testing'. The majority of candidates now present a range of photographic images that are both informative and of high quality, which is especially important where high marks have been awarded and evidence needs to illustrate the complexity and quality of construction and manufacture of coursework.

Despite continued improvements in many centres knowledge and understanding of coursework requirements and their hard work to improve candidates abilities to target marks effectively, there is still a significant number of centres allowing candidates to pursue work that is not up to the required standard for GCSE and does not match the requirements of the course. Such work, which limits candidates' opportunities for success, is entirely acceptable if it matches the abilities of individual candidates and is marked appropriately, but in almost all cases where this activity was seen, over-marking took place.

Hanging mobiles using CNC cut-outs and string, simplistic pull-along wooden toys and butt jointed open boxes are examples of limiting design and make tasks that are inappropriate and cannot elicit high marks in criteria 2 and 5.

It is pleasing to note that most centres were successful in their approach to coursework and made an effort to ensure that design folios arrived on time for moderation, correct paperwork was included and requests for extra photographs etc. were acted upon quickly.

Administration

The vast majority of centres followed Edexcel's instructions and procedures efficiently with few problems, although moderators reported some difficulties in the following areas of administration:

- Addition errors in CMRBs
- Errors in transferring marks from CMRBs to OPTEMS
- No annotation in CMRBs
- Low levels of response credited highly
- Candidate and teacher authentication in CMRBs not signed
- Selected sample not supplemented with highest and / or lowest scoring candidate's work

Detailed Comments

Criterion 1

Identify needs, use information sources to develop detailed specifications and criteria.

Needs

The vast majority of candidates were able to score well in this criterion by recognising a problem, identifying a need and writing a design brief. Significantly more candidates scored full marks this year because they identified a target market for their proposed product.

Some centres presented candidates with a theme or generic design brief and while this is quite acceptable, it is essential that candidates take ownership of such starting points to personalise and focus subsequent work to allow diversity of ideas among a cohort and to prevent possible replication.

The use of centre generated starting point statements such as 'storage' or 'movement' is entirely acceptable, but to say 'You have been asked to design and make a jewellery box for teenagers that must safely store small items', or 'A toy manufacturer has asked you to design and make a pull along toy in softwood that includes a cam operated mechanism', is somewhat prescriptive and likely to influence and limit candidates' opportunities in other assessment criteria beyond 'Needs'.

Information

Centres appear to have an improved understanding of what is required in this assessment section as candidates are being more selective in their choice of content. Despite the assessment criterion stating that information should be selected and used from a wide range of appropriate sources, the key words are 'select' and 'appropriate' as all information gathered must focus on the problem in hand and relate directly to it. No credit can be awarded for general research gathered from Internet sites, databases of materials properties or magazine cut-outs that are presented as padding.

Information should come from a focused range of at least three sources and could include research into the context/environment where the product will be used, analysis of existing similar products, market research, research into relevant materials and components.

Where a questionnaire is used as part of market research, there is no benefit in including every completed questionnaire gathered by a candidate, but an analysis of the results is highly relevant.

Specification

More candidates are appreciating the significance of a strong specification and how influential it can be in other areas of assessment such as ideas, develop, review, tests, checks and modifications and consequently, many more strong specifications were seen this year.

The specification should include reference to form, function, user requirement and budgetary constraints and should contain points that have developed from research and information gathered previously.

Candidates would benefit from breaking the specification down into well-organised sub-sections so that they can focus on individual sections. Sub-headings could be: function, user requirements, performance requirements, materials and size, safety and quality, scale of production, budgetary constraints.

Specification points should contain more than a single piece of information, so that each statement is justified. It is not enough to state that a product should be of a certain size as this is a meaningless statement until it is justified by a further statement to say for example that it needs to fit into a particular place in a room.

The third mark in this assessment criterion is gained by considering budgetary constraints, but simply stating a notional cost is not enough. Statements must be justified by further information which may come from market research regarding what potential customers would be prepared to pay, costs of materials or comparison with existing product prices.

A specification should include technical and measurable points wherever possible, so that ideas and their development can be objectively evaluated using clear design parameters.

Criterion 2

Develop ideas from the specification, check, review and modify as necessary to develop a product.

Ideas

Moderators reported that candidates produced mixed responses to this assessment criterion. Where high quality work was seen, it contained alternative ideas that were realistic and workable and stemmed from creativity and flair. In these cases, ideas were linked to points of specification and were evaluated appropriately.

In general, centres over-rewarded candidates in this section where there was often a lot of work presented which did not proceed beyond the medium level of response.

It is important that candidates understand that they should avoid producing lots of work in this criterion that does not progress beyond the same point of design quality and content for each alternative offered. It is better to produce fewer ideas and concentrate on detailed well thought through work that is well annotated to include good technical understanding of materials techniques and processes relating to a product.

Ideas can be sub-systems or part-ideas of a product and there should be a strand of continuity and progression running through this section that shows a candidate's train of thought.

It is important to ensure that candidates' levels of response in designing are appropriate to GCSE D&T demands and the 40 hours of time available as it is essential that subsequent work can target the full range of marks available.

Develop

Many candidates were able to target marks effectively and gain high credit in this section by ensuring that their intended product was developed and moved on through selecting the

best features of their design ideas and producing a clear and detailed 'final design proposal' as an outcome of this assessment criterion.

More candidates now understand that 'develop' illustrates 'change' and should include evidence of elements of previous design ideas being used to produce the final design proposal.

Many candidates used modelling as an important part of 'develop' to test their design proposals against specification points and did this through the use of 3D materials (evidenced via photographs) and 2D and 3D CAD. Modelling should be thought of as rapid representation of ideas or their sub-systems. There must be a point to modelling and this should be explained e.g. to test proportions, materials, mechanisms etc. Develop should also include details of dimensions, materials, processes and equipment to be used during product manufacture.

Unfortunately, a significant number of centres over-rewarded candidates for their work in this assessment section, where there was little evidence of development and many candidates simply selected a previously designed alternative idea and repeated it in total, without moving the design on. Marks were sometimes awarded in this section where identified evidence had previously been credited under 'ideas'.

It is important that the final design proposal produced in development matches the level of demand for this GCSE course and contains enough information to enable a skilled third-party to manufacture the product without further reference to the designer. This information will include materials, dimensions, constructional techniques, manufacturing processes and finishes.

Review

This assessment criterion remains problematical for the majority of candidates who are happy to explain details of materials and construction processes regarding their proposed designs, but fail to evaluate their work in progress against the points of product specification. The majority of candidates who gave consideration to their specification did so subjectively and often used a tick-box chart to measure one idea against another, without any valid criteria or supporting evaluative statements.

To achieve the high mark in this criterion, ideas should be reviewed or evaluated against the specification as they develop. Some centres awarded marks for review based on the final summative evaluation, which is not acceptable.

Criterion 3

Use written and graphical techniques including ICT and CAD where appropriate to generate, develop, model and communicate.

Written communication, other media, ICT

As was evidenced last year, the vast majority of candidates targeted marks effectively in this assessment criterion and centres awarded marks appropriately. Good candidates used specialist technical vocabulary to communicate clearly and logically and presented their work using a range of media such as photographs, charts and tables, models, cut and paste information etc.

Most candidates are expert users of ICT and some excellent standards were seen in this regard. The use of 2D and 3D CAD continues to grow, although there was not as much evidence of the use of programs such as Pro/DESKTOP as might be expected considering its widespread availability in schools. Moderators reported that a noticeable feature of product manufacture this year has been the growth of sophisticated CAM equipment such as laser cutters. Only a very few centres presented work that contained no ICT at all.

Criterion 4

Produce and use detailed working schedules, which include a range of industrial applications as well as the concepts of systems and control. Simulate production and assembly lines using appropriate ICT.

Systems and Control

Moderators reported that this criterion was extensively over-rewarded by centres and continues to cause problems for many candidates who do not understand how to access the marks available.

For high marks, it is necessary to produce an outline plan for one manufacturing activity relating to the candidate's final product that explains the input(s), process(es) and output(s) and feedback paths that identify where performance checks are made. As was the case last year, many candidates drew flow diagrams of their manufacturing activity but failed to label the input, process output and feedback. Some drew a decision diamond to indicate feedback and were credited for this, while others who were more successful created graphical keys to identify the relevant sections.

Schedule

The requirements of this criterion were better understood by candidates, but hardly any scored full marks. 'Schedule' implies the use of time, but this key ingredient was often missed out by candidates who frequently presented a flow chart of manufacturing activities, mentioning materials and processes, but gave no indication of time or quality control. Where timings were considered, Gantt charts were popular as a planning tool, but many students failed to focus on the specific timings associated with manufacturing, producing timings for the whole of the project, including design activities.

Candidates can gain full marks for both Systems & Control and Schedule through an integrated systems diagram/schedule, but separate evidence for each must be present.

Industrial Applications

This year, many centres continued to under assess candidates in this criterion where there was often photographic evidence that they had 'used' an industrial method in their work. Candidates only require evidence of having used a single industrial method in their product manufacture in order to gain the high mark in this criterion.

The use of CAD machinery, vacuum forming equipment, jigs for repeated accuracy in multiple production, other machinery that would be used where repeatability was necessary such as routers, centre lathe (used beyond simple procedures), all fulfil the requirements of 'using' an industrial application.

Any reference to batch or high volume production as part of 'Industrial applications' must relate to a candidate's product and describe how that product would be manufactured beyond a one-off prototype

Criterion 5

Select and use tools, equipment and processes effectively and safely to make single products and products in quantity. Use CAM appropriately.

Select and Use

As always, this assessment section is enjoyed by the vast majority of candidates who use it as an opportunity to show their skills in producing the final outcome of their previous design work. Moderators reported that a wide range of interesting work was seen and that the majority was complete, functioning and appropriate.

This year has seen a continued improvement in the accuracy of centres marking in 'Select and Use'. It is now the norm to see explicit evidence underpinning marks awarded in this section and candidates appear aware of the need to evidence which tools, equipment and processes they have used during the manufacture of their product and they have done so through the use of annotated photographs, systems and control, schedule and dedicated charts. Evidence of 'select' was successfully produced by the majority of candidates who have been guided well by centres who are now familiar and comfortable with the requirements of this assessment area. Evidence for 'use skilfully', was usually presented in the form of a series of detailed photographs that exemplified the skills and accuracy of construction achieved by individual candidates during the manufacture of their product. Unfortunately, candidates who had been allowed to pursue tasks at the design and develop stages that were simplistic and did not match the course requirements could not achieve high marks in this criterion. Simplistic and undemanding work, however well made using appropriate tools, equipment and processes, cannot elicit high levels of credit in this assessment criterion. Centres must ensure that the work candidates embark upon at the beginning of a project is appropriate to the capabilities of individuals and will allow them to achieve at least their potential.

Make Products

As in 'select and use', this year centres have improved their accuracy in awarding marks in this assessment criterion, which produced a wide range of final outcomes from candidates that matched the final design proposal created as part of 'develop'. Most projects were appropriate to the level of complexity demanded for this course and this allowed candidates access to the full range of marks available. However moderators commented that a significant number of products produced were inappropriate.

It is understandable that candidates of lower ability will produce work of lower demand that does not reach the requirements of good quality GCSE work, but it is not acceptable to award high marks for such work, as some centres did.

It is essential that candidates are guided in their final choice of product in order to ensure that they are working at an appropriate level and to their true potential.

The assessment statement to access the high level of marks highlights the requirement that candidates must make a high quality product which relates to most of the features of the design proposal. This means that there must be evidence of making a product that meets most of the quality requirements of the final design proposal in terms of sizes, tolerances, function, reliability and matches most details of materials, construction, fixtures, fittings and form. Where a detailed final design proposal is not in evidence in the 'Develop' criterion, marks in this assessment section will be limited.

Evidence for this assessment section is provided through photographs and it is encouraging to note that moderators were pleased with the quality and quantity of images presented by the vast majority of candidates in support of their efforts in producing a practical outcome.

Work Safely

Most candidates were able to score well in this assessment criterion by providing explicit evidence of their understanding of safe working practices. They used annotated photographs, reference to safety in systems & control and schedule, or by recording risk assessments as part of select and use.

More candidates scored full marks this year by including consideration for the safety of others, but many more failed to consider the safety of others working around them.

Once again, some centres awarded maximum marks in this criterion and annotated the CMRB as 'teacher observation'. This approach is worth only the low mark and the

statement must detail what has been observed. Explicit evidence must be presented for higher marks.

Criterion 6

Devise and apply tests to check the quality of candidates work at critical control points. Ensure that candidate's products are of suitable quality for the intended use. Suggest modifications that would improve the product's performance.

Tests and Checks

Once again this year this assessment criterion was not targeted very well by most candidates, who described only limited testing, which did not always relate to the specification. Testing was often subjective and superficial and was sometimes based on tests carried out and credited in 'develop'.

Candidates who were successful in this section often used photographic evidence and succinct annotation to support their descriptions of testing, which was always carried out against points of specification.

To access the high mark, candidates are required to develop and use appropriate testing techniques to check the product against the measurable points of the specification.

Evaluate

Moderators indicated that this criterion was not well done by the majority of candidates whose evaluations tended to be subjective and superficial and hardly ever made reference to the tests and checks carried out previously. Some candidates included user views in their evaluations and this helped the objectivity of this section.

Some centres used this section to reward candidates under 'Review', which was not acceptable.

Evidence to justify the award of the high mark in this section requires candidates to consider their test results and user views when presenting a summative evaluation and to relate their findings to measurable points of specification.

Modifications

As was the case last year, most candidates were able to suggest some modifications that would improve their product, but many were cosmetic and did not focus on improving the performance or quality of the product.

Each modification suggestion should follow on from points of evaluation, which in turn should be linked to tests and checks.

It is obvious from moderator feedback that most candidates find criterion 6 difficult to deal with as it is quite a challenging and rigorous intellectual exercise that demands higher order skills of analysis and synthesis that must be assembled using extended writing. Therefore it would be of benefit if candidates were able to see the relationship and inter-dependence of each sub-section of this assessment criterion and realise that modifications should be based on the previous summative evaluation and this in turn should have arisen from the tests and checks carried out on the product.

**GCSE Design and Technology: Resistant Materials Technology
Principal Examiner's Report
Unit 3973, Foundation Tier**

General comments

This is the third year that this specification has been examined. The specification tests candidates' knowledge and understanding of resistant materials and products, processes and the effects of producing and using them on society and the environment. The written paper tests their application of this knowledge and understanding through their responses to questions about products and the processes involved in their manufacture, both in school and as part of large quantity production.

It was evident that the candidates' knowledge of processes was lacking in depth and sufficient detail. Centres must be advised that candidates should be prepared for this examination using the specification as a guide. It is not sufficient to rely upon and assume that candidates will gain sufficient knowledge and understanding through practical designing and making in their coursework.

Most candidates performed reasonably well where questions were targeted at school workshop production but where commercially produced products were introduced candidates showed limited knowledge. Their knowledge of commercial processes was generally lacking and as a result candidates' responses were limited. Where questions asked for an explanation or description candidates could give a reason but lost the second mark because they did not justify or qualify their answers. Centres should also be reminded that candidates must write on the paper in ink rather than pencil and that no correction fluid or pens should be used. It was also more notable this year that some candidates are writing unsuitable and inappropriate comments about their teachers and the exam in general. This must be discouraged as it can be, and in some cases, it is very offensive. Candidates must also be encouraged to use only the space provided for their responses. Again it was more significant this year to see a number of responses running across both pages, through into the margins or design question responses drawn on another part of the paper.

Foundation Tier (2F)

Most candidates showed a limited range of experience throughout the paper and as a result could score some marks across the paper. There were some obvious areas of knowledge of materials and processes that were not covered by some Centres which penalised their candidates. This was evident even in the first question which highlighted a limited knowledge of basic tools and their uses.

It must be stressed to candidates that the question needs to be read carefully in order to score marks, without wasting too much time on responses that do not score marks. Centres also need to make candidates aware that the number of marks available for responses is shown in brackets at the end of each part question. Notice should also be taken of the information in the Teacher's Guide (pages 11 to 15) that gives clear guidance as to the distinct meaning of the wording and word hierarchy used in questions for this examination ie give/state/name/describe/explain. This should form part of teaching practice to students in preparation for this paper. It is obvious from the types of responses given by candidates that some Centres did not cover some parts of the specification.

Question 1

Q1(a)(i) and Q1(a)(ii) This section was slightly better answered in comparison to last year with most candidates able to name some of the tools shown and they were able to describe their use. However, knowledge of tools and related processes remains generally weak. Very few candidates were able to correctly name the die and describe its use and there were few correct answers for the G-cramp. Many candidates need to be more specific in the description of the use of the tools. Too often, responses were deemed to be too generic 'clamping' or 'screwing'.

Q1(b)(i) The majority of candidates correctly identified 'Tray 2' as being the tray which makes most efficient use of the material.

Q1(b)(ii) The majority of candidates correctly identified the waste material.

Q1(c)(i) A well answered question with most candidates able to name the 'type of corner joint'.

Q1(c)(ii) Few candidates were able to correctly name two corner joints but most managed one with the most popular answers being, finger, mitre and dovetail joint.

Question 2

Q2(a) A good number of candidates were able to correctly identify ABS from the list of plastics.

Q2(b)(i) Generally the properties of materials were not fully understood. Most candidates were able only to identify one property of plastic.

Q2(b)(ii) 'Plasticity' was poorly understood with most candidates only able to offer one reason why the plastic must have this property. The more general answers related to the plastic needing to become a liquid.

Q2(c) Another poorly answered question about the properties of materials. Most candidates however were able to offer at least one property, that being 'electrical conductor'.

Q2(d) A surprisingly poor level of response with a large number of candidates unable to explain why the copper wire was coated with a plastic material. The most common answers were linked to 'insulation' and 'electrocution' but the majority failed to go on and fully explain the reason.

Question 3

Q3(a) A number of candidates were able to offer additional specification points for safety but the level of response in relation to 'performance' and 'function' were on the whole poor. Too many responses were too vague 'it must work properly' or 'it will not sell if it does not do what it says'. Some candidates simply repeated the specification points given and subsequently scored no marks.

Q3(b) Generally a poor level of response about the property of hardness and the suitability of silver steel for the knife blade. Most incorrect responses referred to the fact that the knife blade would not break in use.

Q3(c) Good numbers of candidates were able to respond with answers showing an understanding of 'less money tied up in machinery'. However, too many vague and generic responses were observed relating to it being cheaper, quicker and the fact that they did not have to buy materials.

Q3(d) The majority of questions did not answer this question well with only one mark being scored for 'rotating/swivelling' or 'easy way to secure the tools'. Very few responses were fully explained allowing all the marks to be fully accessed.

Q3(e)(i) The majority of candidates were able to give one correct response. Most related to the ease of folding, but too many responses were too vague, 'it should do what it is supposed to do'

Q3(e)(ii) Not a well answered question. A good number of candidates failed to understand that this test was related to 'one check that was to be carried out on the jaws of the multi-tool.' Most correct answers were related to 'no rough edges'.

Q3(f)(i)(ii) The majority of candidates were able to 'state' rather than 'explain' how the multi-tool achieved its purpose. This therefore meant that only half marks could be scored on this part of the question.

GCSE Design and Technology: Resistant Materials Technology
Principal Examiner's Report
Unit 3973, Higher Tier

It was evident that centres had entered candidates correctly for this tier of the examination. A greater number of candidates showed a greater understanding of what the key words in questions were asking of them ie describe/explain. Notice should be taken however of the information in the Teacher's Guide (pages 11 to 15) that gives clear guidance as to the distinct and specific meanings of words and their hierarchy used in questions in this examination. This should form part of teaching practice to students in preparation for this paper. It is obvious from the types of responses given by candidates that some centres did not cover some parts of the specification.

Question 1

This is an overlap question between the two tiers.

Q1(a) Most responses to this question scored well for the safety point and reason with very few candidates fully understanding the difference between performance and function. Very common wrong answers referred to being able to cut or being hard enough to cut through hard materials. A lot of responses were simply repeats of those already given in the stem of the question.

Q1(b) Generally a poor level of response about the property of hardness and the suitability of silver steel for the knife blade. Most incorrect responses referred to the fact that the knife blade would not break in use or that it was strong.

Q1(c) Good numbers of candidates were able to respond with answers showing an understanding of 'less money tied up in machinery'. However, too many vague and generic responses were observed relating to it being cheaper, quicker and the fact that they did not have to buy materials.

Q1(d) The majority of questions did not answer this question well with only one mark being scored for 'rotating/swivelling' or 'easy way to secure the tools'. Very few responses were fully explained allowing all the marks to be fully accessed.

Q1(e)(i) The majority of candidates were able to give one correct response. Most related to the ease of folding, but too many responses were too vague, 'it should do what it is supposed to do'

Q4(e)(ii) Not a well answered question. A good number of candidates failed to understand that this test was related to 'one check that was to be carried out on the jaws of the multi-tool.' Most correct answers were related to 'no rough edges' but very few candidates went on to fully describe their answers.

Q1(f)(i)(ii) The majority of candidates were able to 'state' rather than 'explain' how the multi-tool achieved its purpose. This therefore meant that only half marks could be scored on this part of the question.

Question 2

Q2(a) There were a range of different responses here which scored full marks for many candidates. Most scoring less than full marks scored at least one mark for giving potential hazards to eyes and the need to wear goggles.

Q2(b) There were very few candidates scoring more than one or at most two marks by completing the table. Most scored a mark for sanding the shape before applying varnish and a small number scored a mark for turning the profile. A third common mark was for giving some reference that the blank needed the corners taking off to make an octagon. On the whole this question was very poorly completed.

Q2(c) Most knew that varnish protects or enhances the finished product but only a few scored the full two marks by justifying their answer to this question.

Question 4

Q4(a) Two properties was the most that the majority of candidates gave, usually relating to durability and the ability to mould. Many candidates showed limited knowledge of thermoplastics with guesses about low melting points and malleability.

Q4(b) The differences between the two classifications of plastic were reasonably well answered. Many candidates scored two marks for 'thermoplastics can be remoulded whereas thermosets are one-shot'. Some centres had covered the structure of plastics and candidates showed this with good descriptions.

Q4(c) The addition of texture to the bottle scored half marks for most candidates in a number of alternate ways. Many identified the cap and grip and others the Braille information and gave a suitable amplification. The ability to incorporate the moulding in manufacture was also a common answer.

**GCSE Design and Technology: Resistant Materials Technology
Principal Moderator's Report
Unit 3973, Coursework**

General Comments

Fourteen centres prepared candidates for entry to the short course in Resistant Materials Technology (300 candidates). Similar to the performances noted last year, most candidates performed at their appropriate level and some excellent standards were seen, where well-motivated candidates targeted the assessment criteria effectively.

Once again, some short course project work was of very high quality and would have achieved high marks in the full course. Although it is commendable that candidates are producing such standards, it is not necessary to demonstrate such high levels of complexity in the short course project, which is designed to be completed within 20 hours. Where candidates had gone beyond the requirements of the course, it was obvious that many had spent well in excess of the recommended 20 hours on their work

A significant number of centres used Edexcel's approved Task Sheets, which were helpful in organising portfolios and keeping the number of sheets candidates used down in number and avoiding needless padding. However, in some cases, this style of presentation was limiting, particularly where able candidates were restricted in their opportunities to express themselves more fully.

All centres presented a range of good quality photographs to support marks awarded to candidates and this was extremely helpful during moderation, particularly in assessment areas such as 'Select and Use', 'Make Products' and 'Testing'. The majority of candidates now present a range of photographic images that are both informative and of high quality, which is especially important where high marks have been awarded and evidence needs to illustrate the complexity and quality of construction and manufacture of coursework,

Most centres applied the mark scheme consistently, but in some cases, candidates were over-rewarded where there was not enough evidence in design folders to support the marks given. This was particularly noticeable in criteria 2 where large numbers of marks were available for 'design' and 'develop'.

Administration

The vast majority of centres followed Edexcel's instructions and procedures efficiently, with few problems although moderators reported some difficulties in the following areas of administration:

- Addition errors in CMRBs
- Errors in transferring marks from CMRBs to OPTEMS
- No annotation in CMRBs
- Low levels of response credited highly
- Candidate and teacher authentication in CMRBs not signed
- Selected sample not supplemented with highest and / or lowest scoring candidate's work
- One centre's work was not received until one month after the closing date for receipt of coursework.

Detailed Comments

Criterion 1

Information

Most candidates were able to target marks effectively in this assessment section and were able to achieve at least the medium level of response. It is essential that a high degree of selectivity is applied to the information collected, which should be from more than two sources, so that it is appropriate and useful when writing the specification and producing designs. Information gathered in this criterion could be presented on no more than two comprehensive pages.

Irrelevant padding that is general and could be applied to any proposed product should be avoided, as it is worthless and time consuming.

Information could come from sources such as research into the context/environment where the product will be used, analysis of existing similar products, market research, research into relevant materials and components.

Specification

Specifications were not well written and were often superficial. Few considered and justified budgetary constraints. This very important element of the design process should be well considered and have a considerable amount of effort spent on it as it is very influential in eliciting marks in other assessment criteria such as ideas, develop, tests and checks and evaluation.

The specification should include reference to form, function, user requirement and budgetary constraints and should contain points that have developed from information gathered previously.

Candidates would benefit from breaking the specification down into well-organised sub-sections so that they can focus on individual sections. Sub-headings could be: function, user requirements, performance requirements, materials and size, safety and quality, scale of production, budgetary constraints.

Specification points should contain more than a single piece of information, so that each statement is justified.

A specification should include technical and measurable points wherever possible, so that ideas and their development can be objectively evaluated using clear design parameters.

Criterion2

Ideas

As evidenced last year, in this assessment section, many candidates achieved high marks by focusing on a limited number of alternative designs and using sub-systems and detail designing to support their major design ideas. However, a significant number of candidates produced weak work in this criterion and many settled on the first idea they produced, which limited their potential to gain marks.

There is no requirement to produce several alternative designs and it is often better to produce fewer ideas (more than one) and concentrate on detailed well thought through work that is well annotated to include good technical understanding of materials techniques and processes relating to a product. Reference to the specification and information gathered should be a feature of this section.

It is important to understand that the same standards of D&T competency are expected for the grades range in the short course, as in the full course, but it is also expected that candidates will produce less work to achieve them.

Develop

When developing ideas, some excellent modelling was in evidence in the form of 3D CAD and physical construction and candidates used this to good effect when developing their final design proposal. Unfortunately, some candidates seemed not to understand the concept of development and were satisfied to use a previously created idea and repeat it in full in this section.

Candidates should understand that 'develop' means 'change' and should include evidence of elements of previous design ideas being used to produce the final design proposal. It is not acceptable to select a previously designed alternative idea and repeat it in total, without moving the design on.

Candidates should ensure that a clear and detailed 'final design proposal' is an outcome of this assessment criterion, as it will be used in evaluating the prototype in terms of matching its intended features.

Modelling is an important part of 'develop' and can include the use of 3D materials (evidenced via photographs) or 2D and 3D CAD to test ideas against the specification requirements. Modelling should be thought of as rapid representation of ideas or their sub-systems. There must be a point to modelling and this should be explained e.g. to test proportions, materials, component values, ingredients etc.

Develop should also include details of dimensions, materials, processes and equipment to be used during product manufacture.

There should be enough information presented in this section to enable a skilled third-party to make the product without further reference to the designer.

Criterion 3

Written Communication

In this criterion, the vast majority of candidates scored high marks through their logical use of appropriate technical vocabulary. Only a few candidates were unfamiliar with terminology and descriptive terms relating to their proposed product.

In order to score high marks, the necessary information that relates to the product should be clearly communicated so that the reader can readily understand all of the information presented without making assumptions about what may or may not be meant by particular statements.

All information presented should be logical and relevant; the information should be easy to find, being presented in clear sections and on well-organised pages.

Specialist technical vocabulary that represents the material area of D&T study should be used appropriately and with precision.

Other Media and ICT

The majority of candidates are competent users of ICT and were able to score well in this section through their use of appropriate computer packages and their ability to present work using media such as photographs/cut-outs/models/mock-ups have been used to inform the development/evaluation of ideas already presented. More than one form of ICT should be used to generate, develop, model or communicate information or ideas relevant to their product.

Criterion 4

Systems and Control

Despite not understanding the requirements of systems and control, many candidates scored well in this criterion as it is combined with schedule.

In this assessment section, candidates should produce an outline plan for one manufacturing activity for their product. The plan should explain (label) the input(s), the process(es), the output(s) and feedback of the activity to show where performance / quality checks will be triggered. An indication of the correct sequence of operations undertaken during the manufacturing activity that relates time and quality control should also be included

Where time plans are used (Gantt charts or similar), they should only focus on product manufacture and should not include the whole design, make, evaluate activity.

Industrial Applications

This criterion was often under-rewarded by centres, where candidates had presented evidence of having used one industrial application in the manufacture of their product.

In this assessment section, there should be evidence of candidates having used at least one appropriate industrial method in the manufacture of their own product.

Candidates only require evidence of having used a single industrial method in their product manufacture in order to gain the high mark in this criterion.

Appropriate industrial methods are sometimes difficult to determine, but in general can be said to be the use of processes, equipment and machinery found in commercial activities that allow accurate, repeated production to take place e.g. CNC equipment, vacuum forming, use of jigs, etc

Any reference to batch or high volume production as part of Industrial Applications must relate to a candidate's product and describe how that product would be manufactured beyond a one-off prototype

Criterion 5

Select and Use

In this criterion, candidates presented some excellent work that was supported by clear photographs that gave detailed information about the quality of work produced.

Overall, centres awarded marks consistently and in line with Edexcel's standards

Almost all project work taken to a final conclusion was of an appropriate level of demand for the short course in GCSE Resistant Materials Technology and contained enough rigour to challenge candidates over the few working hours available to them during the course. Some candidates produced low-level work, but it was usually marked appropriately. Only a few candidates were over rewarded in this assessment section for work that was undemanding and inappropriate.

In this criterion, candidates should present evidence of having selected most tools equipment and processes that are appropriate and necessary for carrying out the various tasks involved in making their product.

Candidates must also demonstrate their ability to use the selected tools, equipment and processes with a high degree of skill, accuracy and safety when making their product.

For high marks in this assessment criterion, it is important that when candidates demonstrate their skilful use of tools, equipment and processes, the level of demand of the product is appropriate to the demands expected in high quality GCSE work.

Simplistic and undemanding work that is well made using appropriate tools, equipment and processes but is unchallenging, cannot elicit high levels of credit. Centres must ensure that the work candidates embark upon at the beginning of a project is appropriate to the capabilities of individuals and will allow them to achieve at least their potential in the time allocated to manufacturing as part of the short course in D&T.

Select and use can be evidenced in systems & control, schedule, photographs charts and specific listings

Develop

As in 'select and use', this year centres have improved their accuracy in awarding marks in this assessment criterion, which produced a wide range of final outcomes from candidates that matched the final design proposal created as part of 'develop'. Most projects were appropriate to the level of complexity demanded for this course and this allowed candidates access to the full range of marks available.

In this assessment section, candidates should provide evidence of making a product that meets most of the quality requirements of their final design proposal in terms of sizes, tolerances, finish, and function.

The complexity of the product should reflect the shorter time available to candidates entered for the short course, in that there should be evidence of challenging making work, but there should be less of it than in the full course.

The final outcome should relate fully to the features of the final design proposal and this should include any modifications made in light of experience gained in the making process and should match details of specified materials, constructions, form and aesthetics.

If candidates are not able to produce a final design proposal as part of 'develop', they will be unable to match their prototype to the features of that proposal, so it is essential that this is evidenced in a candidates work.

Evidence of 'Make Products' should be presented in photographic form and a single clear image is the minimum requirement. However, it is ideal for candidates to include a range of photographs as part of their design folder to illustrate and support aspects of making that they wish to highlight.

Criterion 6

Tests and checks

As with last year, this criterion was not well addressed by most candidates whose efforts often lacked organisation and did not relate to measurable points of the specification. Descriptions of tests were not detailed and often reflected an intention to test rather than describing what had already been carried out.

Where tests are carried out, they should be described in detail and justified to say why they are being carried out.

Credit for testing can only be gained where specific tests relate to the performance or quality of the final product and they must be physical tests. Marks cannot be awarded for notional, subjective testing that discusses for example what material or process to use.

Candidates should use their product specification as a basis for tests and checks, and tick-boxes and marks out of ten for tests should be avoided.

A lack of measurable points in a weak specification will inevitably cause problems in this section, as candidates will struggle to devise helpful and meaningful tests to inform the subsequent sub-sections in this assessment area.

Evaluate

Many candidates struggled to summatively evaluate their product effectively and comments were often superficial and did not relate to testing the product under working conditions, including third-party comments and suggesting realistic modifications to improve the product performance.

Evaluation should relate to some of the measurable points of the product specification and should be as objective as possible, with most statements being supported with evidence.

Candidates should try to organise their evaluation statements to avoid rambling and repetitive accounts that are descriptions of their actions regarding problems encountered during manufacture, rather than evaluative statements based on previous tests and checks

It is important that statements of evaluation are objective and not based on personal preferences and once more, the quality of the product specification will determine the quality of response - a well structured specification with measurable points allows more objective evaluation to take place.

Third-party evaluation and field trials carried out under realistic conditions are features that add extra objectivity and are informative in suggesting useful modifications.

When considering modifications, candidates should present more than one suggestion for changes. Each suggestion should arise from a different evaluation point and should include reasons for the proposed improvements.

**GCSE Design & Technology: Resistant Materials Technology
(Full Course: 1973)**

Grade Boundaries - Summer 2005

Overall Grades

The figures given below are the minimum subject marks required for each overall grade in the summer 2005 examinations.

(Foundation Tier out of 100)

C	D	E	F	G
52	42	33	24	15

(Higher Tier out of 100)

A*	A	B	C	D	E
84	72	60	49	40	35

Component Marks

The figures given below are the minimum marks required for each component grade in the summer 2005 examination.

(Coursework 01 out of 102)

A*	A	B	C	D	E	F	G
	80		56	45		23	

(Paper 2F out of 88)

C	D	E	F	G
44	36	29	22	15

(Paper 2H out of 88)

A*	A	B	C	D	E
65	55	45	36	30	27

**GCSE Design & Technology: Resistant Materials Technology
(Short Course: 3973)**

Grade Boundaries - Summer 2005

Overall Grades

The figures given below are the minimum subject marks required for each overall grade in the summer 2005 examinations.

(Foundation Tier out of 100)

C	D	E	F	G
49	39	29	19	9

(Higher Tier out of 100)

A*	A	B	C	D	E
79	69	59	49	39	34

Component Marks

The figures given below are the minimum marks required for each component grade in the summer 2005 examination.

(Coursework 01 out of 84)

A*	A	B	C	D	E	F	G
76	66	56	46	37	28	19	10

(Paper 2F out of 44)

C	D	E	F	G
20	17	14	11	8

(Paper 2H out of 44)

A*	A	B	C	D	E
30	26	22	18	14	12

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