CONTENTS

DESIGN AND TECHNOLOGY

Paper 0445/01

Common Core

General comments

The vast majority of candidates appeared to have no problems accessing the questions. ***Part A*** was designed to test candidates' knowledge of the Common Core content and many showed that they were well prepared in this area, scoring high marks. As usual, there was a wide range of responses to ***Part B*** questions and many candidates should be congratulated on the wide range of design ideas presented and the depth of information included with the final solution.

Candidates are encouraged to set out their response to the ***Part B*** question in line with the sections of the question, as asked, as this helps the Examiner to follow their thought process.

There were very few rubric errors and candidates handed in their answers to the two parts of the Paper as instructed on the front of the Question Paper. The Examiner appreciates the cooperation in this respect.

Comments on specific questions

Part A

Question 1

The majority of candidates applied colour or shade in a suitable way and indicated that the dial cover was transparent. Candidates were also expected to show the curved corners, by toning the colour/shade, for the award of all 6 marks.

Question 2

(a) Most candidates were able to identify part **A** as a chain but few named correctly part **B** as a sprocket or driven (gear).

(b) Many candidates were unable to indicate that a belt and pulley system had a less positive action with less grip and, as such, would be likely to slip.

Question 3

Candidates were able to state one likely safety hazard when using a strip heater together with a linked safety precaution.

Question 4

(a) The majority of candidates was able to explain the difference between ferrous and non-ferrous metals by referring to the fact that they either contain iron or are subject to rusting.

(b) Candidates could normally name a ferrous metal.

(c) Candidates identified a wide range of non-ferrous metals and alloys.

Question 5

(a) Many candidates named correctly all three types of projection with perspective probably giving the most difficulty.

(b) Most candidates were able to explain why type 3, orthographic projection, was the most suitable for working drawings. The Examiner was looking for reference to: simplification of each view; accurate dimensions; sections; hidden detail etc.

Question 6

(a)(b) Most candidates were able to identify natural and man-made structures.

Question 7

(a) The majority of candidates knew ways in which energy could be lost during the conversion process.

(b) Fossil fuels were identified by virtually all candidates.

(c) Candidates were familiar with a wide range of renewable energy sources.

Question 8

Most candidates were able to identify at least two of the tools identified in Fig. 4. Many knew the scriber but the try square or engineer's square was often referred to as a set square.

Question 9

Candidates were generally familiar with ways of evaluating prototypes, referring to testing and other forms of user/consumer group evaluation.

Question 10

The production sequence caused few problems for candidates.

Part B

Question11

This was, by far, the most popular question and candidates were extremely imaginative in their design ideas for candle stands.

(a) Candidates had little difficulty listing four safety points about the candle stand suggesting: stability of stand; candle held firmly; non-flammable materials; low heat conductivity etc.

(b) Points about appearance ranged from: fitting in with room style and colours to creating a good setting for the candle(s).

(c) Although there is no intention to specify the number of design ideas, candidates should be able to gain maximum marks through three or four well communicated ideas if they are different in nature and include meaningful detail and annotation. There is a temptation for candidates to present many simplistic drawings or variations on a single theme. This section presents the opportunity for candidates to 'think with a pencil' and to be as brave as they wish in the creation of design ideas. Candidates are advised to add brief notes identifying possible materials and constructions rather than simply presenting aesthetic aspects of their designs.

(d) Good evaluations were often in list or bullet point form and referred to the requirements of the design problem and specification points made earlier in the question. Unfortunately, evaluations were often somewhat subjective in nature. Candidates are reminded of the need to give reasons for the choice of ideas for development.

(e) For the award of high marks candidates are required to provide sufficient information from which a skilled person could make the design. This should be in the form of detailed drawings including dimensions and all constructions. Any appropriate projection method or combination of methods can be used. Unfortunately, candidates often simply repeated drawings and ideas from the previous section adding little of the required detail. This section of the question carries the highest proportion of marks and as such should be given an appropriate amount of time.

(f) Candidates often gave generic terms such as wood, metal and plastic which is unacceptable. Specific materials must be identified with reasons for choice which link to the developed design idea. Unfortunately, candidates' responses were often of no relevance to the suggested product.

(g) Good responses tended to focus on just one, often small, part of the candle stand, as the question. Successful candidates made it obvious that they were familiar with production methods.

Question 12

This was the second least popular question although intended for those candidates who had followed the graphics option. Unfortunately, outcomes often lacked imagination and, as in previous years, lacked detail on production and assembly methods to be used.

(a) Candidates often struggled to identify points about the function of the pet carrier and tended to repeat those in the question.

(b)(c)(d) See **Question 11 (c)** - **(e)**.

(e) Candidates were generally familiar with the use of computer-aided techniques in design work of this type including benefits such as: speed; accuracy; ease of change etc.

(f) A few candidates only were able to specify a professional printing method for the company name or logo.

(g) The Examiner was somewhat disappointed by responses to this part of the question for which 7 marks were available. Successful attempts tended to be graphical in nature with simple instructions.

Question 13

This was the second most popular question but still answered by a relatively small number of candidates. Candidates who did attempt this question often produced some very imaginative ideas for the unit but did not follow these through to practical methods of construction.

(a) Candidates successfully listed points about the safety of the unit being able to link these to potential hazards in the bathroom and for the children concerned.

(b) Points about the appearance focused on the need to encourage children through the use of topics that interested them and therefore attracted their attention.

(c)(d) (e)(f) See **Question 11 (c)** - **(f)**.

(g) Some candidates produced interesting box designs but, very often, outcomes lacked the imagination of the unit's design and were lacking in detail.

Question14

This question, requiring candidates to design a hand held drilling device, was answered by very few candidates indeed. However, when attempted, designs often indicated that candidates had a good understanding of the design problem and were familiar with the principles of mechanisms in devices of this type.

(a) Candidates were usually able to identify functional requirements of the device listing those such as: firm grip; holding different materials/shapes; ease of use; no damage to material etc.

(b) Safety features focused on the user as required and included: protection from thin sheet material slipping; swarf; secure hold; easy adjustment; safe handle etc.

(c)(d) (e)(f) See **Question 11 (c)** - **(f)**.

(g) Outcomes tended to be manufactured from different metals and responses from some candidates indicated that they had a good understanding of fabrication and machining methods.

Paper 0445/02
Communication

General comments

There was a general improvement in the standard of work again this year.

There are areas of the syllabus, however, in which further improvements are needed. These include, in particular, the correct method for showing sectional views in orthographic projection and the discriminate use of colour and shading.

Comments on specific questions

Question 1

Hand drill

Relatively few candidates attempted this question and, of those who did, only a small number gained satisfactory marks.

(a)(i) One mark was given for line quality, one mark for the use of the correct scale, one mark for the view A drawn on the given vertical centre line and seven marks for the accuracy of the view. Most candidates gained more than half marks, although surprisingly, a common error was to draw the 6mm diameter hole twice as large as it should have been.

(ii) It would appear that relatively few candidates had experience in drawing sectional views. Two marks were given for showing a sectional view and a further mark for the view correctly projected from view A. Equal credit was given for an answer either side of view A, providing it was the correct way round. Seven marks were given for the accuracy of the view and the remaining two marks for the correct use of section shading technique. Candidates who failed to draw a sectional view were obviously penalised severely.

Up to three marks were given for a suitable method for joining the knob to the metal strip, which allowed the knob to rotate freely. Few solutions showed a practical method of assembly.

Up to three marks were given for a suitable shape for the knob, which would make it easy to grasp. Most candidates gained marks for appropriate shaping of the knob.

(b) Whereas most candidates gained one mark for using appropriate shading to show that the knob was made from wood, only a very few were able to represent the shininess of the metal strip.

Question 2

Logo

This was by far the most popular question and candidates gained a very wide range of marks for their answers.

(a) Up to four marks were given for sketching quality and four marks for the investigation of suitable ideas. To gain all these marks it was expected that two significantly different ideas would be investigated and that the investigation would show the letters B.O.A.T. assembled to form the shape of a boat. Little credit was given for the shape of a boat with the letters written on it.

(b)(i) One mark was given for the use of the correct four letters, up to three marks for quality of presentation and up to two marks for an answer that largely filled the space available. Most candidates gained the majority of these marks, losing marks only for poor quality drawing.

Eleven marks were given for a logo that satisfied the brief in that the assembly of letters gave a good representation of a boat and the logo was well proportioned. A further four marks was given for style and flair that would be needed to make the logo suitable for a television programme.

(ii) Colour is an area of the syllabus in which further improvement is needed. It is appre[illegible] availability and quality of colour in the examination room is limited, but in general mo[illegible] discretion are needed. Up to five marks were given for the effective use of colour.

It was pleasing to see so many good answers to this question.

Question 3

Electronic timing unit

(a)(i) One mark was given for sketching quality and three marks for investigation of a complete set of numbers for the electronic timing unit. Most candidates gained very satisfactory marks for this part of the question, although some answers included numbers that were totally unsuitable for the purpose. It must also be assumed that some candidates did not read the first line of the question carefully enough, as some answers showed an incomplete set of numbers.

(ii) To gain full marks for this part of the question, the numbers had to be similar to the given 0, drawn with care and correctly spaced. Many candidates lost most of the six marks available as a result of careless presentation.

(b) Most answers showed an isometric view drawn on the correct axes and gained three marks. A further mark was available for the use of the correct scale and two marks for quality of presentation. The remaining fourteen marks were given for the accuracy of the isometric view. A common error was to draw the timing unit the wrong height.

In general, this question was answered well by many candidates.

Question 4

Model funfair stall

(a) There were few accurately drawn symbols of projection.

(b)(i) Four marks were given for the construction of the pentagon and it should be noted that any method that produced an accurate solution was given equal credit.

One mark was given for the stays and a further mark for drawing quality. Few candidates were able to draw a regular pentagon.

(ii) A total of nine marks were given for the roof: four for the accuracy of the bottom edge; one for sketching the curved lines and one mark each for the stays.

Candidates tended to gain higher marks for this part of the question.

(c) One mark was given for the correct height of the development of the base of the stall. Three marks for any accurate method to determine the length of the development and up to two marks for the accuracy of the answer. Many candidates gained all six marks.

(d) This part of the question was answered badly. A graphical solution was required in the question and few solutions showed this. Equal credit was given both for a construction based on the front view and plan and for a construction drawn separately. Up to two marks were given for an accurate answer and some credit was given for an accurate answer that was calculated.

Paper 0445/03

Realisation

General comments

Generally the candidates seemed to be well versed in the theory of materials and their use, especially as far as wood products are concerned. The popularity of the questions making use of wood is evident by the large number who chose to attempt them, and there were some extremely good answers.

The question regarding metal was only well answered by a small number. Use of metal does not seem to be popular and is mostly weak. Knowledge of plastics when using vacuum forming and strip heaters was usually an area where candidates were able to make a fair attempt.

The content of sketches verses notes proved to be good. Candidates were encouraged by the questions and responded by making good use of sketches supported by brief notes. This produced a good many clear logically presented answers.

Questions 1 and **2** caused some confusion. **Question 1** should have been answered in terms of construction, and **Question 2** in terms of assembly.

Comments on specific questions

Question 1

This was possibly the most popular question and candidates were able to show a clear understanding of tools and practical skills; good clear sketches were widely used throughout.

(a) Some candidates chose plywood but failed to mention that it needs to be for exterior use. They then chose to join the corners using dovetails, which would be unsuitable. Halving would be the only acceptable answer here. Knowledge of suitable preservative for outdoor use was weak. Suitable hard or softwood was the norm and many good clear answers were seen.

(b) The word thermosetting was missing in most cases, but vacuum forming and producing the tray was well documented, though explaining how the method of production would produce a rigid product was often unclear.

Question 2

Another very popular question, though not always well understood.

(a) Candidates generally did not appreciate the relevance of the entrance size in protecting a small bird from a larger one.

(b) Many unnecessarily complex explanations of construction when hammer and nails were appropriate.

(c) As previously stated, knowledge of preservatives was weak.

(d) The majority answered this part very well, though choice of cutting tools was often restricted to types of saw.

Question 3

Although flat pack kits are now commonly used few candidates attempted to answer this question.

(a) Well answered by all who attempted it.

(b) Deciding on sizes of material proved to be difficult; very few answered this successfully.

(c) There were many examples of clear sequence drawing. The selection of tools was very good.

Question 4

This was not a popular question, although, except for the final part, it was mostly well answered.

(a) Good reasons were given for the choice of material.

(b) There were some very good examples of net/development shown.

(c) There was good clear sketching and identification of the tools required.

(d) Little knowledge was shown of cutting, making edges safe, bending and joining. Practical application of metal tended to be weak.

Paper 0445/04

Technology

General comments

The overall performance of candidates was good. This was typified by good use of technological terminology to demonstrate candidates' good levels of knowledge and understanding across most aspects of the syllabus. Candidates in most cases were well prepared for the examination and had clearly benefited from good teaching and specific coaching in sound examination technique. All candidates were able to score marks on all questions attempted according to their ability. Sketching was used appropriately to respond to questions as required. It was also apparent that many candidates had benefited from practical experience of Technological project and practical work - this being reflected in the examples they were able to offer in support of their responses.

Comments on specific questions

Question 1

This question was not a popular choice with candidates.

(a)(i) Many candidates recognised the need for modelling circuits in terms of perfecting circuit performance and avoiding damage to components and wasting resources and time.

(ii) Most but not all candidates could correctly identify the positive and negative rails on the breadboard.

(iii) Many candidates had clearly used CAD software packages in their practical work and were able to draw upon this experience to respond here.

(b)(i) Most candidates recognised the benefit in reduction of size of circuitry by using PCB technology.

(ii) This element was very poorly answered with only a few candidates scoring marks.

(c)(i) Few candidates appreciated the need for a movement activated device and did not therefore access marks here.

(ii) As above.

(iii) Few candidates achieved good scores on this element. Those that did clearly benefited from hands on electronics experience of this circuit.

(iv) Many candidates could identify the diode.

(v) Though most candidates knew that the diode would only allow current flow in a partic… fewer could say why this was needed. Some identified the use of a diode as a protec… but only a small number could state the problem of possible damage caused by back emf… speaker coils.

(vi) Again only those candidates with practical experience identified the use of a chip carrier to avoid… the need for direct soldering of the IC.

Question 2

This was a very popular choice of question.

(a)(i) Many candidates could correctly identify this mechanism.

(ii) Most were able to name the worm and worm wheel.

(iii) Fewer recognised the ability of this mechanism to move very accurately through small distances as needed to tune the strings.

(iv) Many candidates were able to show the conversion through 90 degrees but there was some confusion as to the types of motion which are *both* rotary.

(b)(i) Some candidates were able to recognise the application of over centre toggle linkages but many got bogged down with over complicated solutions. Sketching was generally very good with good use of exploded diagrams in many cases to illustrate key aspects of the designs shown.

(ii) Many candidates were able to offer sound explanations of the term “moment”. The relationship between force and perpendicular distance of acting was well established with the majority of candidates.

(iii) In most cases this element was very well answered.

(iv) The majority of candidates could give a correct example of a class 2 lever.

(v) Fewer candidates could suggest ways of modelling linkages, though most recognised the need for modelling. The use of card and paper fasteners was correctly offered as a method and the use of CAD software packages too was correctly offered by a small number of candidates.

(c) This element was not well attempted. Few candidates could show how a cam can be used to lock or hold a system in place. There was clear demonstration of the knowledge of how a cam and follower work but not of its application in this situation.

(d)(i) Generally most candidates could correctly label the system. A few candidates were confused between the ratchet and the pawl.

(ii) Most candidates could give a correct application but a few were not specific enough in their responses, e.g. crane instead of winch drum on a crane.

(iii) Only a few candidates were able to suggest a feasible method for disengaging the pawl from the ratchet on a temporary basis to allow free rotation.

Question 3

This too was a very popular choice of question.

(a)(i) Most candidates were able to perform the reactions calculation effectively with only a few minor errors in units applications.

(ii) Most candidates were able to correctly label the member.

(iii) Few candidates appear to have understood the concept of structural sections and consequently few gained marks on this element.

(iv) A great many candidates were able to offer sound methods of reinforcement repair te[illegible] were based upon the use of gusset plates. Inserts and other reinforcements.

(v) Many candidates recognised the use of accurate and reliable methods of deflection measur[illegible] by suggesting the use of either DTI gauges or Strain Gauge.

(b)(i) Most candidates recognised the proportionality of the elastic behaviour of the sample.

(ii) Many candidates were able to identify the non-proportional extension of the sample and of its permanent deformation in this region of the test.

(iii) Very few candidates appreciated the plastic behaviour of the material at this stage of the test and did not appreciate that the extension was vastly greater than the load would normally produce.

(iv) Most candidates identified the breaking point for the sample at this point of the test.

(c)(i) Most candidates appreciated the relationship between force and c/s area of a member as being stress.

(ii) Fewer candidates could rationalise that by increasing the area of a member the stress could be reduced.

(iii) Many candidates could recall the formula for strain but applied the wrong figure for the change in length. They lost marks accordingly.

(iv) Most candidates were able to explain this term very effectively.

Question 4

Very few candidates attempted this question.

(a)(i) Generally well considered answers that were effectively supported in the main by good clear annotated sketches.

(ii) As above with most answers nominating the use of telescopic tubing secured by pins or threaded thumbscrews.

(b)(i) Few candidates recognised the low power advantages of using LEDs.

(ii) There was a considerable amount of confusion as to the difference being that a battery is comprised of a set of cells where as a cell is a single unit.

(iii) Most candidates could identify pro's and cons for the use of batteries, e.g. portable yet would eventually need to be replaced or recharged.

(iv) Few candidates scored full marks here and again those candidates who scored well had benefited from hands on experience of connecting LEDs.

(c)(i) Poorly attempted with few candidates being able to demonstrate feasible solutions to temporary attachment devices. Those candidates who scored well used good graphical techniques to support their responses and showed practical workshop experience in their response style.

(ii) Most candidates were able to score well here and showed good understanding of the needs of the users of such a device.

(d) Few candidates understood the need for a jig here to speed up production without compromising quality and accuracy of the product.

Paper 0445/05

Coursework

General comments

Candidates produced a wide range of coursework projects and in most cases these were intended to solve a real or personal problem raised by the candidate concerned. In addition to the usual range of toys, household items and furniture, interesting outcomes included: school uniforms, robots, solar powered cooking, futuristic buildings, swimming pools and other community projects.

There were few cases where candidates seemed to be stifled by poor problem selection but in cases where familiar problems were chosen, outcomes often showed little evidence of imaginative interpretation and/or creativeness of outcomes. It is important that Centres guide candidates in this respect so that they can take full advantage of the potential range of opportunities presented by the initial problem.

The sample of work presented for moderation was suitable in most cases and Centres had generally applied the assessment criteria appropriately although, in some cases, not at the correct level. Centres new to this syllabus are advised to refer to the exemplar coursework material contained in the Distance Training Pack, obtainable from CIE, if they have not already done so.

Centres are reminded of the need to select the moderation sample in line with the guidance given by CIE. The sample should cover the full range of candidates' marks and include the highest and lowest marks. All folders must include clear photographic evidence of artefacts showing detail to support the award of marks in addition to an overall view of the product made.

CIE also asks that Centres check the addition of marks on the Coursework Assessment Summary Form and the transfer of total marks to the MS1. Where internal moderation has taken place it is helpful to the Moderator if the moderated marks for each of the assessment headings can be shown in place of, or in addition to, the original marks.

Comments on specific assessment headings

Analysis of problem and design brief

Candidates stated clearly the problem to be addressed and this was followed by a concise design brief in the majority of cases. However, the degree to which candidates researched the design **problem** varied enormously. Candidates should be encouraged to complete adequate and relevant research in order to create a suitable knowledge base prior to the formulation of the specification. 'Cut and paste' examples should always be accompanied by comments which go beyond a simple description of the article.

Far too often this research consisted simply of information on materials, components and constructions taken directly from textbooks. Information of this type is totally irrelevant at this stage of a design process and should be considered at the development stage when ideas have been explored.

Candidates should state clearly at this stage if the outcome is to be in the form of a model and the reasons for this.

Specification

The majority of candidates included specification points but very often these were generic in nature and could be applied to any product. The specification should build up from points that emerge from the analysis of the design problem and should state clear and specific requirements for the design outcome and, for the award of maximum marks, points should be qualified wherever possible. The **specification** is best presented by a list of separate requirements so that subsequent reference during the exploration of ideas, and both ongoing and final evaluation is straightforward.

Exploration of ideas

This section is the most successful in discriminating between candidates of different abilities. This is where candidates can show their ability 'to think with a pencil' and include evidence of genuine design creativity. Successful candidates included a wide range of different ideas presented by clearly annotated sketches. Too often candidates presented a few formal drawings that showed little design flair and tended to follow a single concept.

These ideas can be presented most successfully through simple pencil sketches and candidates should be encouraged to include everything that comes to mind however practical it may appear at the time. These ideas do not have to be of complete products but can be mini developments of parts of ideas as thoughts come to mind. Annotations should include comment as to how an idea might link to the specification.

Candidates at some Centres made good use of ICT skills in their design folders and this is encouraging to see. However, the Moderator is not convinced that this is the most appropriate method for exploring and recording design ideas in this section of the folder.

Development of proposed solution

This is the section of the folder where candidates take their chosen idea or selection of ideas and make further detailed decisions on form, materials and construction methods to be used in the final product. Many candidates found this difficult to do and in far too many cases the final idea was simply a repeat of one of the ideas recorded in the previous section. Candidates are not required to develop more than one potential outcome.

Final drawings of the design solution were generally well presented and gave sufficient information for the manufacture of the product.

Planning for production

This section must show clear evidence that the production of the artefact has been planned in advance. It should not be a record of what has already taken place, as was the case with the work of many candidates.

Details of materials and components to be used should be included together with the main stages of the production set out in logical sequence. A suggested time plan should assist candidates and should include comment when this has not been adhered to. Candidates are not required to include detailed descriptions of basic procedures such as the preparation and simple marking out of materials, but they should be encouraged to show evidence of the planning of unusual techniques particularly those that are new to them.

Quality of production

Candidates should be congratulated on the wide range of technologies and materials being used and this included sensible use of textiles in the manufacture of some products.

Photographic evidence indicated that some candidates were able to work to a very high standard of construction and finish to the extent that products could be put to good use.

Evaluation

Candidates should be encouraged to include photographic evidence of product testing in the intended environment or by the intended user. They can then go on to link the outcome to the original specification and make objective and qualified judgements on the success of the product. This section should also include suggestions for further modifications or possible improvements to the product.

Too often candidates referred only to issues and problems linked to the making of the artefact with the addition of their own subjective appraisal of the outcome. Evaluations of this type cannot be awarded marks beyond the low level of achievement.

Where the final product is a model then evaluation should be of the effectiveness of the model itself and of the potential full size artefact whenever possible.