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DESIGN AND TECHNOLOGY

Paper 0445/01

Common Core

General comments

All questions were accessible to candidates and scripts covering a wide range of marks were submitted. There was no evidence to suggest that candidates were unable to complete the paper in the time available.

Most candidates labelled each part of their response to the chosen **Part B** question and this should be encouraged, as the Examiner is able to follow each individual design process in the marking of this question. The Instructions to candidates on the cover of the question paper ask candidates to fasten the separate drawing paper, used for **Part B**, to the question paper at the end of the examination. The Examiner asks that this be done in such a way that it is easy to access all parts of candidates' responses for marking purposes. A treasury tag or a lightly tied piece of string holding the drawing paper at the back of the question paper is most suitable. Metal staples should not be used as they are difficult to remove before marking can take place.

Comments on specific questions

Part A

Question 1

There were some very good responses to this question with candidates demonstrating sound graphic communication skills. The Examiner was looking for appropriate use of colour/shading to enhance the shape of the model car and to bring out detail of the wheels and cockpit. Very few candidates were unable to score any marks on this question.

Question 2

Most candidates were able to identify two health hazards linked to wood dust and to suggest ways of reducing the risks. Wearing of goggles and face masks were the two most popular correct responses. Dust extraction equipment and ventilation were also accepted.

Question 3

- (a) Welding, brazing and soldering were obvious answers to this question and the Examiner was happy to accept two different types of welding.
- (b) The majority of candidates were aware that aluminium melts at a lower temperature than steel.

Question 4

- (a) Most candidates identified at least two good or bad points in the evaluation of the key rack but many tended to repeat themselves or focused on just one point.
- (b) The most popular correct suggestions for the improvement of the design were: to give some shape to the back board; to add more hooks; to improve the shape of the hooks and to have two fixing holes. Other sensible responses were accepted.

Question 5

A surprisingly large number of candidates were unable to draw the follower in its lowest position. Some credit was given if they simply drew the follower at the bottom of the cam.

Question 6

The majority of candidates were able to make some attempt at the perspective sketch. For maximum marks candidates were expected to show that: two points had been used; the drawing was in reasonable proportion; there was some tapering towards the distance and that lines were of reasonable quality.

Question 7

Most candidates were able to identify at least two of the fixing components although the rivet and staple caused problems for some.

Question 8

- (a) A reassuring number of candidates identified the arch and suspension bridges. The Examiner also accepted key stone for (i) and cantilever for (ii).
- (b) Many candidates identified tension at X but fewer gave compression at Y.

Question 9

- (a) As might be expected there was some confusion between ergonomic and anthropometric considerations for the telephone. The Examiner accepted any two aspects of the telephone's form that would be linked to the shape, comfort and safety of the human body. Answers that focused on sizes of the human body were not accepted.
- (b) Some candidates drifted away from aesthetic aspects of the telephone in their answers to this part of the question. However, many were able to identify at least one aspect linked to easy shaping, smooth lines, lower costs, colours etc.

Question 10

Many candidates had some understanding of kinetic and potential energy, the most straightforward answers simply stating released or movement energy and stored energy. Candidates sometimes enhanced their answer with an example of at least one of these.

Part B

Communication skills were often of a high standard and candidates should be congratulated on this aspect of their work. Good use was made of colour to enhance drawings and this should be encouraged.

Candidates are reminded that they do not have to produce large numbers of drawings and notes to achieve high marks. The Examiner is looking for evidence of depth of understanding and design thinking in all sections of the chosen question.

It would be helpful to the Examiner if candidates could identify clearly, at the top of the drawing sheet, the number of the question being answered.

Question 11

This was by far the most popular question and candidates seemed familiar with storage methods for items of this type.

- (a) Most candidates were able to list at least three points about the function of the unit including: ease of access; protection of items; limited access for children; humid bathroom environment etc.

- (b) Some candidates sketched a vast number of ideas but these were often variations on a single theme rather than different approaches. Candidates should be encouraged to annotate their drawings and give some consideration to the detail of possible constructions and materials rather than simply showing aesthetic aspects of their designs. Although there is no intention to specify the required number of design ideas, candidates should be able to gain high marks from perhaps three or four well communicated ideas if they are very different in kind and include good annotation and detail. Marks are awarded for the suitability of the design ideas and the quality and clarity of communication techniques.
- (c) Evaluations were often quite lengthy and wordy, tending to be repetitive and somewhat subjective in nature. Candidates are encouraged to refer to the function and requirements of the design brief and to list evaluations point by point. There was a tendency for candidates to simply describe the design ideas rather than list the good and bad points of each.
- (d) The quality of responses to this part varied enormously. Some drawings were high quality graphic representations of the final product whereas others were just repeats of ideas from the previous part of the question. Candidates are expected to show detail of all parts of the construction and to include dimensions, if high marks are to be gained. Drawings do not have to be formal orthographic presentations but the information should be such that the design could be made by an appropriately experienced person.
- (e) Generic terms such as wood, metal and plastic are not acceptable and candidates should identify specific materials relating to the chosen and developed design idea. Again reasons should be specific to the design and not general such as: strong, durable, cheap etc.
- (f) Candidates tended to lack meaningful detail for the chosen process and often spent too much time on simple tasks such as marking out and preparing materials to size.
- (g) Most candidates were able to sketch a matching item for the bathroom with soap holders being the most popular. Marks were awarded for the suitability of the design and communication skills.

Question 12

This was probably the second most popular question but many candidates overlooked the specified size of the mirror to be housed.

- (a) Candidates often struggled to list four points about the appearance of the design but acceptable responses included: attractive, smart, trendy, colourful, fashionable, matching surroundings, etc.
- (b) Other factors to be taken into account regarding the function of the mirror included: ease of use hands free, swivel/pivot, stable, etc.
- (c)(d) See Question 11 (b) – (f).
- (e)(f)(g)

Question 13

This question was intended to appeal to candidates following the Communication option in the syllabus but, unfortunately, was often approached in a rather superficial way. However, some candidates gave good explanations of the playing rules for their suggested ideas and really linked the games to ecological or 'green' issues.

- (a) Most candidates had little difficulty in listing three points about the appearance of the board game and included: interesting, colourful, appeal to young people, 'green' connections, etc.
- (b)(c) See Question 11 (b) – (d).
- (d)
- (e) Candidates seemed familiar with the benefits of using computer aided techniques in the design of such products. Reasons included: changes made easily, sending design electronically, easy storage, application of colour, modelling, etc.

- (f) Most candidates produced suitable developments for the box and included fold lines, gluing and opening tabs as required.
- (g) Candidates had little difficulty suggesting lettering styles for the name ECO-WORLD but many overlooked the need to focus on the ecological connection.

Question 14

This was the least popular question although obviously intended for those candidates following the Technology option. Unfortunately, many candidates overlooked the required 'technology' and developed ideas that would never be practical in use.

- (a) Candidates listed functional points such as: ease of use, clear to see, worked from handlebars, little energy required, waterproof, etc.
- (b) Candidates were familiar with points to consider when designing for safety in use such as: control of bicycle, not fouling wheels/controls, clear to others, no loose parts, etc.
- (c)(d)
(e)(f) See **Question 11 (b) – (e)**.
- (g) Many candidates gave superficial consideration to this part of the question and, as such, lost the opportunity to gain most of the eight marks available. Candidates who have followed a Design and Technology course should be able to relate this type of part question to their experiences in the workshop.

Paper 0445/02

Communication

General comments

The standard of work presented was largely the same as in November 2002.

Knowledge and application of appropriate geometrical constructions remain an area of the syllabus in which improvement is needed. Evidence of this weakness was seen mainly in answers to **Question 3** and the construction of the ellipse in **Question 2**.

Comments on specific questions

Question 1

Mug

- (a) Most solutions showed the correct format of the symbol for first angle orthographic projection and gained up to two marks. A further mark was given for accuracy of the drawing.
- (b) Up to two marks were given for line quality and three marks for the correct axes for isometric projection. Most candidates gained the majority of these marks. To gain the seven marks given for the base of the mug, it was first necessary to construct a scrap view of the regular hexagon and then transfer measurements to the isometric view. Many candidates failed to do this and lost two marks. The remaining five marks were given for accuracy of the base. Obviously, if the isometric view did not show a regular hexagon, further marks were lost.

A total of nine marks were given for the conical body of the mug. Of these, four were for correct sizes, three marks for a suitable construction for the isometric circles and two marks for the cone accurately positioned on the base. Most marks were lost for detailed inaccuracies of size.

- (c) Very few candidates gained more than half marks for effective shading of the mug. Up to three marks were given for shading to show the shape of the mug, particularly the roundness of the body, and three marks for a method which represented the transparent nature of the material.

In general answers to this question were disappointing.

Question 2

Package for handkerchiefs

This question was answered well by most candidates. Two marks were given for drawing quality, one mark for use of the correct scale, and one mark for a package which opened at the top. As a result of not reading the question carefully enough, a number of candidates produced a development which did not open at the top. Three marks were given for a viable development which, when assembled would form the required package. It was expected that, as this was a commercial product, consideration would be given to the economical use of card. Uneconomical developments were penalised one mark. Ten marks were given for accuracy of the development of the package, of which two marks each were given for the sloping sides. Inaccuracy of these sides was a common error. A total of six marks was given for gluing and other flaps of which three were for the opening top. A common error was to make the gluing flaps too narrow.

Many candidates were unable to construct the elliptical hole, for which seven marks were given.

Question 3

Paddling pool and shelter

This question tested candidates' knowledge of tangents and tangential arcs. Results were disappointing.

Three marks were given for quality of drawing and use of the correct scale. Up to twelve marks were given for the accuracy of the outline of the pond: two marks each for the position and accuracy of the R10 and R5 arcs, which most candidates gained; four marks for construction and accuracy of the R90 arc, which most candidates failed to gain; and a further two marks for the tangents. Up to nine marks were given for the path round the pond. Most candidates drew the R18 and left hand vertical tangent accurately and gained two marks. The remaining part of the outline was drawn less well. Most candidates showed the triangular shelter drawn accurately in the correct position and gained up to six marks.

In general, this question was not answered well.

Question 4

Notice board for sports park

Most candidates attempted this question and there were some very satisfactory answers.

- (a) Candidates were required to sketch freehand two ideas each for the three specified symbols. To gain all fifteen marks available, the design sketches had to communicate the ideas clearly and investigate two symbols that were both suitable for their purpose and sufficiently different from each other. Hurriedly drawn sketches that gave little consideration to the brief gained few marks. Drawing two significantly different symbols for Sailing appeared to present difficulty to some candidates.
- (b) A further fifteen marks were given for drawing accurately chosen ideas on the given drawing of the notice board. To gain maximum marks, the symbols had to be drawn accurately and with care, for which one mark each was given, be simple without necessary detail so that they could be recognised from a distance, for which two marks each were given and accurately represent the three specified activities, for which the remaining six marks were given.

There were many excellent drawings to be seen which could be immediately associated with the activities.

Surprisingly, a number of candidates confused Sailing with Selling (Saleing?).

Paper 0445/03
Realisation

General comments

As far as wood products are concerned, candidates seemed to be well versed in the theory of these materials and their use. The questions on wood were a very popular choice, and there were some extremely good answers.

However, candidates are failing to make use of a wide range of materials.

Comments on specific questions

Question 1

This was possibly the most popular question and candidates were able to show an understanding of tools and practical skills; but good clear sketches were lacking in many cases.

- (a) Design criteria proved to be confusing for many.
- (b) The choice of materials was usually well considered, though reasons for choice were often negative.
- (c) Technical details proved to be quite good but many candidates were unable to sketch clearly.

Question 2

This was attempted by many candidates but good results were often missing owing to poor use of unclear notes and sketches.

- (a) There was good choice of material with suitable justification.
- (b) The marking out of the material was well done and a clear understanding of the development was apparent. The discussion of cutting and forming the shape together with finishing often lacked clarity.

Question 3

This was not a popular question. Knowledge of vacuum forming was an important prerequisite for this question, and only a small number of candidates were able to attempt this with any success.

- (a) Some candidates failed to identify the need for the use of a thermoplastic material.
- (b) Very few candidates were able to explain the uses of vacuum forming equipment satisfactorily.
- (c) An understanding of the use of patterns when forming plastics with heat was a necessary requirement for this question.
- (d) Little knowledge was shown of cutting, making edges safe, bending and joining. Understanding of the practical application of plastics tended to be weak.
- (e) This part was well answered. Materials were well chosen, together with suitable practical application.

Question 4

Flat packed kits are now commonly used and many candidates attempted this question.

- (a) Many candidates failed to realise the necessity of applying preservative on all parts of the seat before attempting to assemble it.
- (b) The majority did well with this part. The selection of tools was very good.

Paper 0445/04
Technology

General comments

The overall performance of the candidates was satisfactory. Generally the use of sketches to support answers was well used. There was an even spread of responses across questions. The examination provided fair access to the full range of marks and all candidates scored marks commensurate with their knowledge and understanding and their ability. Some poor responses pointed to lack of hands on experience for some candidates - this being particularly apparent in responses offered in designing elements of **Question 4**.

Comments on specific questions**Question 1**

This was the most popular choice of question.

- (a)(i) Most candidates earned marks for identifying the gears and screw but few identified the use of a cam to hold the pencil.
- (ii) A good range of responses to this part with gears and the screw well covered but weaker responses concerning the use of the cam.
- (iii) Most candidates were able to reason the higher level of accuracy of the spring bows due to the use of the screw adjuster and the adjustability of the lead and point.
- (iv) Some good responses here drawing upon hands on experience of using this type of instrument. Sketching used to good effect in explaining how the system could work.
- (b)(i) Few candidates were able to identify the *toothed* belt and pulley.
- (ii) There was good evidence of understanding of the reduction in slip aiding accuracy in this mechanism but few candidates were able to note that the teeth themselves could aid the precise movement and thus the accuracy of the plotter arm.
- (iv) Most candidates were able to determine the MA of the pulley system.
- (v) Few candidates were able to explain that the major drawback for a pulley system is in the need to pull through a long length of chain/rope on the effort pulley to effect a small rise in the load.

Question 2

This was the least popular choice of question.

- (a)(i) Most candidates could correctly identify the push to make (PTM) switch.
- (ii) The use of an LED as a signal device was recognised by most candidates.

- (iii) No candidate could use the standard formula for calculating time period for a given CR combination.
 - (iv) All candidates recognised the use of a Variable resistor to make the circuit adjustable.
 - (v) All candidates were able to explain the need for a relay as an interface device.
- (b)(i)** All candidates were able to name the thermistor.
- (ii) Most candidates could accurately draw the thermistor circuit symbol.
 - (iii) No candidate suggested a sheathing method for protecting the thermistor from water immersion.
- (c)(i)** No candidate was able to explain how the dual transistor model improves circuit sensitivity and reaction time.
- (ii) Few candidates were able to identify the fact that there is greater current flow down through the output end of this circuit.
 - (iii) No candidate could explain the term "Potential Divider" as a biasing device or voltage splitter.
 - (iv) No candidate attempted the calculation.
- (d)(i)** Most candidates could correctly name the three connections of the transistor.
- (ii) No candidate identified the need for a heat sink to protect the transistor during soldering.

Question 3

This was the second most popular question chosen.

- (a)(i)** No candidate correctly calculated the reaction values.
- (ii) No candidate could draw a bending moment diagram.
 - (iii) Few candidates could draw a shear force diagram relating to this system.
 - (iv) Most candidates could suggest that adding a third bracket would reduce sagging. However no candidate identified the idea of reinforcing the shelf with a batten fixed along its front edge.
- (b)(i)** Most candidates identified the benefit of low weight to strength ratio. Fewer were able to identify a second benefit such as the ease of construction or the fact that this is less expensive than a solid wooden door. They could also have mentioned the environmental benefits of this construction method.
- (ii) Most candidates explained the problem of wet weather breaking down this type of structure more quickly than solid wooden construction.
 - (iii) Few candidates identified the use of this construction in the packaging industry.
- (c)(i)** Few candidates identified the use of the grill to keep items on the shelf, the increasing of rigidity with low weight.
- (ii) More candidates identified the need for bracing across the back of the shelves to aid stability and reduce leaning if overloaded.
 - (iii) Few responses focused on the need to fold sheet materials to improve load bearing and to improve their rigidity.
 - (iv) Several candidates explained that this method improved the stability of the shelves.
 - (v) Most candidates were able to label the diagram to show compression forces acting on the top surface and tension forces acting underneath.

Question 4

This was the third most popular choice of question.

- (a)(i) Few candidates scored full marks on this part with some confusion over the term “differing angles of slope”. There were good opportunities here for marks to be gained through design type questions but few candidates were able to take advantage of the marks available.
- (ii) Several candidates were able to propose feasible solutions to this problem and were able to gain the marks available. Good use of annotated sketches was apparent here from stronger candidates.
- (iii) Many of the proposed solutions were far too complicated to work feasibly and did not gain full marks.
- (b)(i) No candidate was able to explain fully the magnification application of the linkage mechanism shown. This pointed to lack of thorough understanding of the principle of levers.
- (ii) Few candidates answered this part fully. A description of the use of card strips, paper fasteners and a backing sheet to test the mechanism was not widely known.
- (iii) Many candidates could offer a definition of a lever. This runs contrary to the weaker responses offered in (i).
- (iv) This part was well answered.
- (v) Most candidates could offer an example of a class three lever.
- (c)(i) Few candidates could offer a full solution to this problem.
- (ii) The use of a variable resistor was widely recognised.

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 expected range of toys, household items and furniture, interesting project outcomes included: temporary housing; bicycle sidecar; drinks can opener; helicopter anti-theft device; walking aids for the elderly; water purifier; lawnmower sun shade; automatic pram rocker; mobile tuck shop; basket ball collection device and sun lounger.

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 include the full range of candidates' marks, including the highest and lowest marks, in the moderation sample sent to CIE. 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 final product.

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.

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.

Many candidates tackle problems that are likely to result in modelling of some nature e.g. architectural models. In these cases it is imperative that this is stated in the brief, with reasons given, and that the model forms the spine of the specification. If this is not done then meaningful evaluation becomes very difficult.

Specification

The majority of candidates included specification points but very often these were generic in nature and could be applied to any product. This section of the folder 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 is straightforward, particularly at the evaluation stage.

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 should 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. There was a noticeable improvement in developments this year but some candidates are still finding this difficult to do and in these cases the final idea was simply a repeat of one of the ideas recorded in the previous section.

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 happened, as was the case with the work of some candidates. Again there was an improvement in the content of this section this year.

Details of materials and components to be used should be included together with the main stages of the production set out in logical progression. 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 marking out of materials, but they should be encouraged to show evidence of the planning of unusual techniques and those 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 linked to the production of the design folder and 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.

Fitness for purpose

There was a tendency for Centres to award high marks to all candidates. It is important that the full range of marks is used to discriminate between candidates.