

# DESIGN AND TECHNOLOGY

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Paper 6043/01

Paper 1

## General Comments

The general performance of candidates was much the same as last year, however, **section A** was a little below the normal good standard for this section. Many candidates were unable to score highly in this general section of the paper, and relied on **section B** to gain the higher marks. Tools and Materials proved to be a well understood part of the syllabus, with some outstanding graphics supporting the text. Processes continue to improve with a high level of knowledge of sand casting and injection moulding. One disappointing comment this year is the return of candidates committing rubric errors by answering all the questions on the paper. These candidates were unable to score highly, and would invariably cost the candidates time and effort. It would help future candidates if Centres pointed out that this practice does not produce any gains.

## Details

### Part A

#### Question 1

There was a mixed response, with many just giving the word 'hardness' and not referring to the temperature.

#### Question 2

There were some good sketches of the bradawl and its use, however, this simple woodwork tool was not known to many.

#### Question 3

The process tended to get a little mixed up with vacuum forming, blow moulding, etc. Injection was the correct answer, and the plastic had to be in a molten state to be shaped.

#### Question 4

Only a small number of candidates could name the boxes – cope and drag, which meant they had no knowledge of the sand casting process.

#### Question 5

There were very well drawn answers, showing the drawer bottom being fitted by a groove, rebate, nailed, screwed, etc.

#### Question 6

Most gave Tensol or Acrylic cement as the bonding agent, but failed to give the reason for the masking tape.

#### Question 7

Only a small number of candidates understood the meaning of 'forging' or its main hazard; the working of hot metal with a hammer.

#### Question 8

Most candidates were able to give a wood finish such as varnish, paint, oil, wax, French polish, etc.

### Question 9

All seemed able to give valid answers to this safety question, with face mask for sanding, G.R.P, grinding, etc., and rubber gloves for glass fibre, resin, acid bath, etc.

### Question 10

This was another question in which candidates tended to mix up the different plastics. The correct answers should have been: squeeze bottle – low density polythene for colours and flexible, and the hot drinks cup – expanded polystyrene for heat insulation and lightweight.

### Part B

#### Section 1 – Tools and Material

### Question 11

Three well known tools.

- (a) Tools named and purpose understood –  
A – Metric steel ruler used for general marking out and checking size.  
B – Metric tape measure for large distance measuring, etc.  
C – Micrometer used for measuring small items such wire, bar, etc.
- (b) (i) Only a few candidates understood that the cut out leg on a pair of odd legs had to be at the end of a steel ruler for it to be set.  
(ii) Most candidates just repeated the answer given **11(a)**.  
(iii) All candidates were able to give detail of the micrometer checking the bar.
- (c) A range of answers were given to checking the worn drill from vernier callipers, drill gauge and micrometer.

### Question 12

In general, candidates showed a good understanding of materials, and the effect elements have on them.

- (a) (i) Some good answers to the problem of hot weather on a softwood bench. The most popular being shrinkage and cracking, etc. A few candidates stated the bench would increase in size.  
(ii) All candidates understood corrosion due to the effect of water and iron resulting in rust.  
(iii) Again well answered, with the candle causing the acrylic holder to change its shape or melt.
- (b) Some helpful examples explained –  
(i) Many used the example of kiln seasoning to remove moisture; others used steam heating for bending timber without breaking.  
(ii) Less well answered as **12(b)(i)**, but still heating for changing metal structure, and able to anneal it for working into shapes.  
(iii) A mixed range of answers on how air can be used with plastics. Answers ranged from fluidising plastic, cooling plastic and shaping plastic, such as blow moulding.
- (c) Not well answered, with many candidates tending to give a general worldwide problem with the environment. The answers should have been related to the candidates' workshop environment.

### Question 13

This was a popular question with candidates who performed well, showing good graphic skills.

- (a) (i) All candidates were able to identify the round headed nail and its use in general joinery.
- (ii) Most candidates were able to name the countersunk screw and its use of joining materials with a flush surface.
- (iii) Not as well-known as the other two fixing devices, but still identified by many. Used for strong joining of mixed material with the aid of a nut.
- (b) (i) Some outstanding drawings of hammers, such as ball pein, cross pein, straight pein, etc.
- (ii) Very good sketches of screwdrivers, straight, posidriv, electric, etc.
- (iii) A wide range of spanners given from ring, flat, adjustable, socket, etc.
- (c) Few candidates offered an answer to this section, or got mixed up and gave different types of fixings as answers. What was required was an understanding of how different materials such as brass, copper, zinc, bronze and tin can provide protection, help the appearance, and improve a base metal.

### Section 2 – Processes

#### Question 14

- (a) All seemed able to offer two safety factors when designing for children. In this case, it was non-toxic materials such as paint, sharp edges and corners, small parts, etc.
- (b) (i) The main answer tended to be the drilling of a hole in the wheel, with how to retain it on the axle missing.
- (ii) There was a poor response to this section, with most candidates trying to make a wheel by cutting it from solid material with a jig saw. The only true method was by turning on the lathe, or using a correct size hole saw.
- (c) Another weak area is the preparing and paintings of the toy, with many just stating 'polish it and paint it'. Little detail about the different processes needed such as sealing, rubbing down with finer paper, primer, undercoat, top coat, etc.
- (d) Excellent end to the question with a wide range of solutions offered by most candidates. The best design tended to be a bridle type joint at the rear of the toy, along with a hole in both the toy and push stick. Next, linking them together by means of a temporary pin, bolt and wing nuts. Others used hooks and eyes, magnets, etc.

#### Question 15

- (a) All seemed able to choose two given processes, and state their advantages and disadvantages.
- (b) Injection moulding, casting, and vacuum forming tended to be the most popular processes to describe with outstanding detail. Building up from pieces, however, proved to be very poorly done, and lacked any real understanding of the problem.
- (c) Quite well done, with most using some form of bending jig or former. However, many failed to mention the brass needs to be heated before bending. A number of different methods offered for fixing the arm to the box, from a simple hole in each side, to a curved bracket fixed to the back.

#### Question 16

- (a) Quite a wide range of materials offered for the clip, such as acrylic, aluminium, mild steel and beech veneers with valid reasons. Some did give impractical materials, such as plywood and cast iron to name a few.

- (b) (i) Marking out the clip proved to be a weak area for many candidates who only use a ruler and scribe. No mention of centre lines, folding lines, engineers square, odd legs, dividers, etc.
- (ii) Cutting to shape was much better described with holding work in a vice with protection, using the correct saw for the material, using abrasive to finish the clip, etc. A number of candidates tried to cut the acrylic material with a hot wire cutter.
- (iii) Forming the clip bends was well described for acrylic and aluminium sheet, as well as using the correct tools, such as strip heater, oven, formers, etc.

#### Question 17

- (a) A very mixed response to this question, with most candidates choosing the blow moulding section first, and a small effort with soft soldering and turning on the lathe. The few who did soft soldering, understood the cleaning part and flux, but failed when it came to the soldering iron and heating part.
- (b) Those who attempted this section did quite well, and prepared the blank well. They mounted it on the lathe, and turned it round, but then failed to reduce it as required or taper turn the end.
- (c) This was well done with most candidates, showing a good understanding of the blow moulding process. The answers were aided by some excellent sketches of the different stages and details.

#### Question 18

**Fluidising** – All seemed to know the process very well, with sketches of the fluidising tank supporting the text. A number missed out on reheating the object coated with the plastic.

**Case hardening** – Again a well understood process of adding a hard coating to a softer metal. Some missed out at the end by not quenching the hot metal in water.

**Lamination** – Mainly wood type answers, with verniers as the material glued together to form the lamination. A number gave plywood as an example which is untrue for forming shapes.

**Extrusion** – Some of the responses tended to be a little mixed up, and ended up as just injection moulding. It was however well done on the whole.

#### Conclusion

The candidates are to be congratulated for maintaining the high level of response shown in past years.

**Section B** – Tools and materials showed a real improvement, with high quality drawings and sketches supporting the text. Processes also gained from better detailed descriptions, with injection moulding and sand casting outstanding. Once again it was the simple tasks such as marking out or building a product pieces that proved a problem. Another area in need of attention is the finishing and painting of objects, such as toys. Many candidates still make general comments, such as 'polish it', when they mean rub down with fine or rough sandpaper. Painting becomes one stage in the process. Injection moulding and casting processes continue to be well understood and described, but building up artefacts from pieces still seems to pose problems for many candidates.

One problem area that Centres still need to address is the use of additional drawing paper for candidates. It makes the marking of some papers extremely difficult, with answers starting out on lined paper, and then reverting to large sheets of drawing paper. Many of the drawing are not numbered, and unordered. Sometimes, questions are marked and totalled, only to find a small section at the rear of a drawing sheet mixed in with another answer. Candidates could well lose out on marks with this practice.

In conclusion, I would like praise the candidates and Centres for their overall efforts this year, demonstrated by the positive approach to the examination paper. I wish them well for the future.

# DESIGN AND TECHNOLOGY

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**Paper 6043/02**  
**Design Project**

## General Comments

The theme topic, **personal time**, was well understood by candidates, and therefore offered many possible areas to investigate. The majority of candidates provided a thorough investigation of the theme area, which resulted in the selection of an appropriate design brief. The published theme included ten possible areas for investigation (threads). These threads provided starting points for the candidates, which often resulted in excellent research. The research was usually organised in a way which allowed the candidate to record their thoughts as the investigation progressed. Decisions about the selected thread and the emergence of a design brief were often logically set out in the first section of the design project.

Where candidates identified a design brief which was personal to them or a family member, the subsequent development and solution was often thoroughly and comprehensively developed in the design project.

Candidates provided a wide range of artefacts as a result of the development of the design project. The following examples give an insight into the breadth and range of the artefacts produced: games, artefacts to contain personal items, games table, storage shelves for books or collections, fish tank stand, music stand, CD storage, cage for pets, jewellery box, chess board and tool box.

## Comments on Individual Assessment Criteria

### Part A – Design Folio

#### **General Analysis of Topic**

Centres continue to provide candidates with professional support during the early stages of the theme development. This approach ensured candidates are guided to progress through problems which are within the scope and capability of each candidate, and also ensured that artefacts can be manufactured using the resources available within the workshop environment. The guidance notes which are published with the project theme set out this area of support. In the majority of cases, it ensured the successful completion of an artefact.

#### **Formulation of Design Brief and Specification**

Candidates produced well defined design briefs, which were often preceded with a clarification of the problem area to be developed. Many candidates offer a conclusion to the general analysis of the theme research, which helps reveal the logical progression towards a clearly defined design brief. Specification points are often comprehensive, and specifically relevant to the problem being developed. Where a specification remains unfocused on the specific problem, subsequent work often lacked the detail required to produce a satisfactory artefact.

#### **Exploration of Ideas**

Marks were available for a wide range of ideas. In most folios, candidates used sketches to give details of up to three ideas. A few candidates considered one idea, which restricted the marks which could be awarded for this section of marks. Candidates generally displayed good sketching skills which clearly communicated the core information for each idea. Many folios included annotations and colour or shading to enhance the ideas.

The use of evaluative comments at this stage often adds value to the work presented. If clearly labelled, evaluation can contribute to the marks awarded to the overall evaluation of the project.

### **Detailed Development of Proposed Solution**

In many folios, the volume and quality of work presented provided a comprehensive development of the chosen idea. In some cases, the development was limited because some of the development issues were not obvious to the candidate. Many folios presented a series of questions which were related to a checklist of stages, or aspects required to be able to manufacture the solution.

Candidates confident with the design process understood the importance of this section to ensure that all aspects of the chosen design were investigated. The majority of candidates provided several drawings of different aspects of the design, and together with annotations, communicated how each aspect was to be resolved. The use of good quality sketches, including in many cases orthographic or three dimensional drawings, helped the clarity of the communication.

### **Suitability of Chosen Materials and Construction**

In general, candidates identified in sufficient detail, the working properties required of any materials selected to make the artefact. Construction details were sometimes missed, or the candidate had not realised that details of joints and fixings were required. In some cases, a long list of materials (e.g. different types of wood) did not add any value to the folio, because no comments were made about the reasons for the selection of the material.

### **Production Planning**

This section is often presented in tabular form, and many candidates show illustrations of the tools and techniques they intend to use to make the artefact. The addition of shading and colour often enhances the display of a very clear and logical sequence, for the completion of the artefact.

### **Communication**

Candidates increasingly display a mastery of Computer Aided Design (CAD) packages which allow them to manipulate images, and then present them in very sophisticated ways in the design folio. This approach is very acceptable, but at some point in the folio, candidates should produce sketches, 2D elevations and 3D pictorial drawings which reveal their hand drawing skills.

## **Part B - The Artefact**

### **Suitability of Proposed Solution**

Marks awarded in this section should not be mixed up with awarding marks for workmanship. The marks awarded are a judgement about the success of the artefact in fulfilling the expectations of the specification, and in general, how suitable the artefact is in solving the original design problem.

### **Workmanship**

Candidates generally produced good quality prototype artefacts. Considering the challenges overcome by many candidates during the construction period of the design project, it is most encouraging to see how candidates have dedicated themselves to completing the artefact to a high standard.

### **Evaluation**

Evaluations have improved year on year. Most evaluations cover the following areas:

- consideration of the performance of the artefact regarding the original problem to be solved
- judgement of performance against the specification points
- testing the artefact in the context it was to be used in
- after testing the artefact, making suggestions for modifications