



General Certificate of Education

Design and Technology: Product Design 5551/6551

Report on the Examination

2006 examination - January series

- PD1D Product Design Unit 1 (3D Design) Materials and Components
- PD1T Product Design Unit 1 (Textiles) Materials and Components

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Unit PD1D: Materials and Components

General Comments

This examination paper, which is now well established, produced a wide range of responses from candidates demonstrating a basic level of knowledge, through to sophisticated and well organised answers at the top end of the mark range.

Rubric infringements continue to be a significant problem, with a large number of candidates completing responses for all four questions. This practice is to be strongly discouraged as it does not give candidates any advantage and more commonly results in one or more of their answers being very poorly done due to the time constraints.

In general, most candidates attempted the paper in a logical order and organised their answers properly. A relatively small but significant number seemed to write their answers on every other sheet of the answer booklet leading to the need for supplementary sheets and, in some cases, complete drawings on separate sheets. This leads to answers being disjointed and difficult to mark.

Quite a number of candidates neglected to write the question numbers in the margin and rule off after each question.

Question 1

The format of this question has now become familiar with centres, and candidates are generally well prepared for it. Generally, this question was well answered with the majority of candidates gaining up to half their total marks from this part of the paper.

- (a) Most candidates correctly gave a polymer such as “polypropylene” for the boat, and a suitable metal such as “stainless steel” for the bench. Answers for the CD rack tended to be less specific with “plywood” being the most common answer.

The best answers linked the properties of each material to the function or manufacture of the product. For example, “polypropylene is suitable for a boat because it has good impact resistance. The boat will be subjected to impacts from other boats, stones, being dropped, etc.” Other answers simply gave lists of generic properties without linking them to the product.

Only a very small number of candidates realised that the catamaran would be rotationally moulded, producing a hollow hull with a substantial wall thickness. The majority of candidates described the injection moulding. The mark scheme allowed for this as some parts of the boat could have been made by this process. Many candidates gained maximum marks for this.

The manufacture of the bench was generally well described with good diagrams of punching and pressing the sheet metal parts, and either die-casting or fabricating the frame.

The manufacture of the CD rack was generally not well explained. There were many references to generic “CAD/CAM machines” that would be used to cut the slots of the rack. Many candidates incorrectly described “heating plywood to soften the resin”. Only a relatively small number correctly described the laminating process.

- (b) (i) This question specifically asked candidates to name **one** material that had one of the properties listed. Many candidates ignored this and gave three materials; one for each property. Unfortunately, a large number gave an incorrect answer in their list.
- (ii) The best answers gave specific examples of a product where the property is needed such as car body panels made from mild steel. These need the material to be malleable so that they can be press formed. On the whole, this was not well answered, with many answers being vague and repetitive.

Question 2

- (a) Most candidates were able to give a suitable definition of the term ‘composite material’.
- (b) Candidates explained why the composites were often better than traditional materials in very basic terms such as composites are often “stronger” or “lighter” than traditional materials. The best answers used examples such as GRP being much lighter than timber and easier to form into complex shapes e.g. a boat hull.
- (c) (i) Many candidates gave excellent answers for this, describing the woven structure of Kevlar and the relevant properties linked to the function or use of Kevlar in body armour.
- (ii) Responses for this question were varied. Most candidates concentrated on CFRP being lightweight but failed to compare it against tubular steel or aluminium. Many described CFRP being very ‘strong’ but again did not put this into context or compare it against an alternative.
- (iii) This was well answered by the majority of candidates. There was good reference to melamine formaldehyde laminate being resistant to heat which it would be subjected to from saucepans and resistant to cleaning products and water which would be used to clean the surface. Best answers explained laminated chipboard is cheaper than granite or solid timber and much easier to cut and shape to fit it into kitchens.

Question 3

- (a) (i) This was well answered with examples such as furniture, shelving, etc, being suitable applications for MDF.
- (ii) Some good examples were given for High Impact Polystyrene such as yoghurt pots, picnic cutlery, etc.
- (iii) Most candidates gave a suitable use for galvanized mild steel such as farm gates, buckets, etc.
- (iv) Styrofoam was less well known, with many candidates naming packaging as a suitable application rather than modelling or insulation which are its main uses.
- (b) Where candidates linked the properties of each material to the function, use or manufacture of the product given, they gained high marks and in many cases up to one-third or more of their total marks. In many cases, however, properties were often generic and unrelated to the product listed in part (a) or, in many cases, the properties given were incorrect. A common statement was “MDF is lightweight”.

Question 4

- (a) This was the least popular of the optional questions on the paper, and it was not well answered.

Generally, most candidates gave an appropriate material for the sun sculpture, with basic reasons for its use; for example, oak because it can be carved into the desired shape. There were some reasonable answers describing the basic tools that could be used to shape the sun sculpture such as coping saws, chisels and so on. Unfortunately, there were many references to 'CAD/CAM' without specific equipment being named or described.

Candidates were less familiar with appropriate materials and manufacturing processes for the metal cat. Many referred to metals that would not be entirely appropriate e.g. copper and then described joining it by 'welding' which of course is incorrect for copper.

Very few candidates gained over half the marks available for this question.

- (b) Knowledge of specific finishes continues to be a problem. Most candidates simply stated "paint the ornamental cat, to give it colour and make it shine", or in the case of the wooden sun sculpture, "varnish it to stop it decaying"; more often to stop it 'corroding'.

Unit PD1T: Materials and Components

General Comments

The quality of work was mixed; there were some very good scripts at the top end but also many poor scripts from candidates who seemed ill prepared for the rigour of an AS examination. Many candidates wrote very confused accounts with contradicting statements.

The majority of candidates followed the instructions to answer only two questions from 2, 3 and 4 with very few attempting all four questions. Candidates appeared to have apportioned their time equally to the questions and there was little evidence of poor time management. There was a good spread of questions attempted with none of the optional ones appearing more or less popular than the others.

The majority of scripts were well presented with legible handwriting. However, there were a number of instances where candidates' handwriting was almost illegible. Despite the best attempts of examiners to read what has been written, if candidates do not communicate clearly they may not access all the marks. There is a particular problem where candidates use very pale blue biro pens.

Many candidates squashed their responses to different questions together in the answer booklet; it helps if candidates rule off at the end of each question and leave a line before starting the next. Where additional sheets have been used they should be fastened to the main answer booklet, but not so tightly that it is difficult to turn the pages. Following the rubric on the front cover of the answer book and listing the questions attempted is very helpful for markers but very few centres had ensured that this instruction was followed.

Quality of written communication was generally satisfactory but many are still writing superficial and disjointed answers which do not give detailed and/or relevant information. It was clear that centres had used past papers when preparing candidates for this examination, especially as many repeated responses which would have been more appropriate for a previous paper and not the one with which they were faced.

Candidates should be advised to look at the mark allocation for each sub-section of the question and to write appropriately, i.e. not giving a half page of reasons for a question allocated only one mark. However, they do need to be reminded to give a wide range of examples when asked to do so in order to show knowledge and understanding relevant to the situation.

Question 1

The format of this question was similar to that used on recent papers with candidates asked to respond to product analysis questions. Photographs were not provided for this examination as it was considered that every candidate would be familiar with jeans style trousers.

- (a) (i) The structure of the twill weave used for denim was clearly described by most although some described it as a plain weave fabric. Those who used a diagram tended to fare well although many inadvertently showed a plain weave as they had not shown the weft travelling over two warp yarns before going under one. There were many who wrote in vague terms about denim being made with ‘a warp and weft’, and few referred to the cotton content. Specific terminology is required in this type of answer.
- (ii) Most candidates stated that denim is ‘strong and hardwearing’, although few considered the effects of the cotton content and even fewer made specific reference to the properties of the twill weave. There were many very generalised accounts which did not earn high marks.
- (b) (i) There were some excellent diagrams and descriptions of the pile weave used for velvet with many being awarded full marks. There were also some very poor attempts by candidates who clearly had no idea about a pile weave structure.
- (ii) Responses almost invariably named an appropriate fibre.
- (c) (i) The satin weave structure is generally known and understood but descriptions often lacked vital and/or accurate information. Diagrams often showed a twill, not a satin weave.
- (ii) As before, most named an appropriate fibre.
- (iii) Those who gave precise qualities related to the intended end use usually earned two marks. A few did not relate the fibre to the satin fabric for jeans.
- (d) Many candidates offered their own personal opinions rather than analysing the appropriateness of the two fabrics for jeans style trousers. Many appeared not to realise that jeans are a style of trouser, not always ‘workwear’, and that it is perfectly possible to make them from fabrics other than denim. The more open minded usually achieved reasonable marks.
Surprisingly some candidates believed velvet and satin to be hardwearing fabrics. Many came to this conclusion because they selected cotton and polyester fibres for the fabric, and then gave the properties of the fibres without applying their knowledge to the specific fabrics named.
- (e) (i) Candidates are increasingly knowledgeable about environmental issues in relation to textiles and there were some excellent responses. Those who dealt with a wide range of issues were rewarded more highly than those who only considered the impact of pesticides and fertilizers on soil and waterways. A number moved away from the subject and wrote about Fair Trade and welfare of the workers. Many made very vague references to ‘chemicals’ and ‘fumes’ being bad for the environment.
- (ii) Responses were of varied quality. Some clearly were unable to translate concerns into constructive advice for manufacturing processes, as evidenced in recommendations to ‘make jeans by hand to save electricity’ and ‘stop using cotton or it will become extinct’. Candidates should be aware that although advice to use natural dyes was accepted, they are not industrially viable alternatives to chemical dyestuffs.

Question 2

This was a very popular question producing a good spread of marks.

- (a) (i) There were many excellent descriptions with full marks awarded. Many used a simple diagram to aid the explanation.
 - (ii) There was good awareness that a quilt has air trapped in the layers but there is still confusion about the precise way in which this trapped air is able to insulate.
 - (iii) Most were familiar with polyester wadding and gave some sound reasons for its use in quilted fabrics. There were a number of candidates who recited the properties of polyester without taking into account the wadding structure. Successful candidates were those who applied their knowledge to the situation given.
- (b) (i) There was good awareness of polar fleece as a fashion fabric but few knew that it is knitted using polyester yarn. Many candidates described it as a bonded fabric and some suggested that it comes from polar bears. Very few responses to this question were awarded full marks.
 - (ii) The popularity of polar fleece was discussed well by many candidates and there were some good comparisons with quilted fabrics. A number referred only to the use of fleece for jackets and quilted fabric for bedspreads, thus restricting their achievement.

Question 3

- (a) (i) Many candidates had problems naming three different zip types and some unusual examples were given, e.g. 'short zip', 'long zip', 'fly zip', 'toothless zip'.
 - (ii) If part (i) was correct, then this part was usually also done well. Many had clearly not read through the question before beginning to answer as there were numerous instances of reasons for choice being given here. This information was then given again in part (iii) which did not make efficient use of time in the examination.
 - (iii) There was a lack of precise detail here with many simply stating that the zip would be 'easy to use'. Candidates need to refer specifically to the choice of the zip type for the application described.
- (b) This should have been a familiar theme and there were some very good responses. Where marks were lost, it was usually because candidates failed to give sufficient and/or appropriate examples to illustrate the points they were trying to make.
 - (c) This question on application of fastenings and quality control was well answered by some candidates and some good marks achieved. Many others, however, repeated information relating to the choice of fastenings, or described safety issues for workers, which was not asked for.

Question 4

- (a) There was good knowledge of the properties of acrylic and its suitability for a sweater and there were many high scoring answers. Candidates should be advised that ‘cheap’ is not acceptable unless there is a comparison with another fibre such as wool.
- (b) A large proportion of candidates rehearsed the properties of the individual fibres but did not give much thought to their combined effect in a blend, and many did not make any reference to the angora content. Of those who did, many were able to consider the percentage of each fibre present, and drew appropriate conclusions.

There was much confusion about the properties of the fibres; there were regular statements about the ‘warmth of cotton’. There is widespread misunderstanding about the resilience of nylon; many candidates think it is the same as stretch, allowing garments to fit closely. They should also be aware that nylon is not absorbent. Many candidates wrote confused accounts with many contradictory statements.

- (c) Many candidates found this a very difficult question and there is still much confusion between woven and knitted fabrics and different types of knit construction. There were numerous cases of candidates referring back to the two sweaters and their fibre content, and not dealing with the differences in construction of the two knitted fabrics. Whilst many made a good attempt at part (i), part (ii) proved too difficult for the majority of candidates with many explaining that weft knit stretches more than rib knit.
- (d) Knowledge of product aftercare has improved slightly with many explaining the part played by the angora hair in the fibre blend; its tendency to shrink in the presence of heat, moisture and friction was the crux of the issue.
It is unclear why many candidates equate machine washing with high temperatures and nasty chemicals as no consideration was given to low temperature programmes and mild detergent types.

Mark Range and Award of Grades

Unit/Component	Maximum Mark (Raw)	Maximum Mark (Scaled)	Mean Mark (Scaled)	Standard Deviation (Scaled)
PD 1D	100	100	43.9	13.8
PD 1T	100	100	40.3	13.2

For units which contain only one component, scaled marks are the same as raw marks.

PD1D (2935 candidates)

Grade	Max. mark	A	B	C	D	E
Scaled Boundary Mark	100	62	55	49	43	37
Uniform Boundary Mark	90	72	63	54	45	36

PD1T (996 candidates)

Grade	Max. mark	A	B	C	D	E
Scaled Boundary Mark	100	55	49	44	39	34
Uniform Boundary Mark	90	72	63	54	45	36

Advanced Subsidiary award

Provisional statistics for the award (233 candidates)

	A	B	C	D	E
Cumulative %	12.0	25.0	53.5	79.0	94.5

Definitions

Boundary Mark: the minimum (scaled) mark required by a candidate to qualify for a given grade.

Mean Mark: is the sum of all candidates' marks divided by the number of candidates. In order to compare mean marks for different components, the mean mark (scaled) should be expressed as a percentage of the maximum mark (scaled).

Standard Deviation: a measure of the spread of candidates' marks. In most components, approximately two-thirds of all candidates lie in a range of plus or minus one standard deviation from the mean, and approximately 95% of all candidates lie in a range of plus or minus two standard deviations from the mean. In order to compare the standard deviations for different components, the standard deviation (scaled) should be expressed as a percentage of the maximum mark (scaled).

Uniform Mark: a score on a standard scale which indicates a candidate's performance. The lowest uniform mark for grade A is always 80% of the maximum uniform mark for the unit, similarly grade B is 70%, grade C is 60%, grade D is 50% and grade E is 40%. A candidate's total scaled mark for each unit is converted to a uniform mark and the uniform marks for the units which count towards the AS or A-level qualification are added in order to determine the candidate's overall grade.