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General Certificate of Education (A-level)
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Design and Technology: Product Design PROD1

(Specification 2550)

Unit 1: Materials, Components and Application

Report on the Examination

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General:

The paper was of a similar format to previous series and questions covered a broad range of materials and applications. Candidates were able to access the full mark range but many seem to have underperformed on the two optional questions in Section B. In previous series, candidates have sometimes found one of the two questions more accessible than the other, but in this examination responses for both appear to be of a lower quality than expected.

Administration:

Despite being given a larger amount of space to complete answers in the answer booklet, there are still a very large number of candidates who use additional sheets, often just to add a few words. In many cases, they have already gained maximum marks in their answer in the booklet, or the additional sheet does not warrant any extra marks. Candidates can often score better when they pay attention to the mark allocation and respond accordingly. For example, a question requiring the reasons why a material is suitable for a specific application worth 6 marks could be answered by stating three appropriate properties and giving a reason why each property is relevant to the product.

The quality of handwriting seems to be improving but for some, the answers are illegible. Centres are advised to assess the quality and clarity of candidates' handwriting and to make appropriate arrangements.

Question 1

(a) The vast majority of candidates were able to correctly define the term 'alloy'. However, a disappointing number failed to mention 'metal' in the answer. Weaker responses included 'two or more materials' or 'two elements'. The very best answers gave a correct definition and stated that it provided enhanced characteristics.

(b) The majority of candidates were able to give an example of a correct alloy and suitable application. The most popular were 'stainless steel' for kitchen ware or 'brass' for door furniture and musical instruments.

Question 2

This was well answered with the majority of candidates able to get at least two correct answers. The mark scheme allowed for MIG welding to be accepted for joining either the aluminium bicycle frame or the mild steel angle. A fairly small number of candidates gave arc welding for aluminium or MIG welding for joining copper.

Question 3

(a) Stock forms of timber were not known well by many candidates who suggested 'hardwood', 'softwood' or simply named timbers such as 'pine', beech etc.

(b) A lot of candidates made reference to aesthetic appeal of oak and the better answers justified this with reference to colour and attractive grain pattern. There were good references to Oak's ability to take a range of named finishes, as well as durability for everyday use items such as chairs or coffee table. Some weaker answers included statements such as oak being a hardwood so it would be stronger than a softwood. Very few candidates mentioned the workability of the material, enabling it to be drilled or cut to make traditional wood joints.

Question 4

(a) This was generally well answered with most candidates able to correctly identify a thermoplastic as a polymer that can be reheated and re-shaped. Lower level responses tended to omit the fat that it can be re-heated or failed to mention heat within the answer.

(b) The vast majority of candidates were able to correctly name a thermoplastic and a suitable application. Some candidates used generic terms such as 'polythene'. Although this is accepted it is not good practice and may not be credited at A2.

Question 5

This was well answered by most candidates. The mark scheme allowed for a router to be used for cutting and engraving acrylic and a laser cutter for cutting vinyl lettering. The flexibility of the mark scheme for this question allowed most candidates to score well.

Question 6

(a) (i) The better responses focussed on the shape memory alloy's ability to respond to heat in the mouth and subsequently pull the teeth into position. A lot of responses tended to be rather generic and focussed on the function of the brace. Many candidates wasted time by describing how the wire would be manufactured. Lower level responses used 'lightweight' for SMA, not recognising that the wire is only very small and thin and so would be lightweight, regardless of the material. The majority of answers focussed on the obvious around toxicity and corrosion. Very few candidates actually described how shape memory alloys work.

(a) (ii) This question was poorly answered with only a relatively small number being able to explain what photo quality cartridge paper is. Many answers focussed on the desirable properties of materials used in point of sale displays, using generic terms such as 'aesthetically pleasing' and 'high quality', rather than the actual properties of photo quality cartridge paper. Centres are reminded that compliant materials feature in the specification for Product Design and therefore candidates must be prepared for such questions.

(a) (iii) This question had very mixed responses. Top answers described the ability of the material to be moulded in hot water/by hairdryer and subsequently re-heated and re-used to allow for alterations to the design. Better answers also showed an appreciation that polymorph could be pigmented/painted and as the material displayed similar qualities to an injection moulded product, could be shown to a client as a realistic version prior to mass production. Many candidates understood the basic properties of polymorph but went onto describe how it can be injection moulded and referred to a production model.

(b) Better responses to this question named a correct alternative material and went on to describe how it could be shaped using specific named tools. For example 'Styrofoam can be shaped using a hot wire cutter, files and glass paper'. Lower level answers gave generic answers for the suitability of the named material such as 'cheap' and 'easy to mould'. Some answers referred to materials more suited to a production model.

Question 7

(a) The majority of candidates were able to suggest a suitable material for the bench, with stainless steel and aluminium being the most popular.

(b) Reasons were generally well linked to the original chosen material. 'Strong' is still a popular property proposed by candidates but few are able to define the specific strength property e.g. compressive strength required to take the weight of people.

(c) This question was generally answered very poorly. Many candidates described the manufacture of the stainless steel bars through extrusion, rather than the fabrication of the actual bench and, therefore, missing the point of the question altogether. Other low achieving answers focused on casting processes or the generic 'CNC machine', the bars being melted or soldered together.

(d) The vast majority of candidates were able to give good answers about the health and safety measures. Typical responses included provision of appropriate safety equipment, guarding and training employees on safe working practices. Many candidates unfortunately thought the question was about safety tests that would be carried out by the manufacturer.

Question 8

(a)

(i) This was mostly well answered with candidates correctly naming an appropriate thermoplastic. Incorrect responses tended to include ABS, PVC and HIPS.

(ii) Most respondents were able to name appropriate properties of their chosen polymer and link them well to the function, manufacture and aesthetics of the bottle. In the majority of cases, candidates gave at least three well explained properties and gained maximum marks.

(iii) This appears to have been challenging for candidates with very few being able to give a full description of blow moulding. Many discussed liquid or granular form polymer being poured into the mould. Top end answers correctly named the parison but many simply made reference to a 'pipe' 'two sheets' or a 'tube' of plastic.

(b)

The top end responses included well reasoned answers with appropriate accompanying sketches. Good reference was made to ergonomic features of the various grips and indents on the bottle as well as the lack of specific finger grooves meaning the grip was universal and comfortable for left or right handed users. A number of references were made to the shape of the mouthpiece enabling easy opening with the teeth. Some candidates suggested the use of TPE for additional grip for sweaty/wet hands or the use of smart materials such as polymorph to provide an individual grip. Lower level responses often stated very obvious points or merely described what the bottle looked like. Many of the lower level responses got ergonomics and function/aesthetics mixed up and they subsequently discussed the use of colours or patterns to appeal to the users, a longer body to hold more drink or adding an extra cap for hygiene.

(c)

Lower level responses tended to make minor changes, if any, to the original package and discussed changing the material to 'see through'. Most popular changes to the package included reducing the size of the package, vertical orientation of the bottle, use of a card based material either for a header board when stapled to LDPE, or as the whole package with cut out features to allow the consumer to feel the bottle grip,

Knowledge of suitable materials was lacking in lower level responses with suggestions such as thermosets, 'cellophane', 'acrylic' or 'polythene'. Better responses included reference to specific polymers such as LDPE or PET.

For the manufacture of the package, a notable number of candidates made reference to inappropriate methods such as 'cut on a laser cutter'. Higher level respondents were able to specify methods such as vacuum forming a blister pack, heat sealing edges or the use of die cutters/nets for paper based materials

Mark Ranges and Award of Grades

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http://www.aqa.org.uk/over/stat.html

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