
General Certificate of Education Design and Technology: Product Design 3D

PROD1

Report on the Examination

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General

The format of the paper was similar to that of recent examinations with all source material printed within the paper. The level of response was varied and questions dealing with polymers were generally more confidently answered than those dealing with timbers and metals.

There are still a considerable number of candidates who list generic, unexplained terms within their answers. Centres should note that terms such as 'cheap', 'strong', 'durable', 'can be finished' and 'easy to shape' will not attain credit and candidates should make reference to specific properties and link these to the particular product.

Section A

- 1(a)** This question proved to be surprisingly difficult for some candidates who were unable to correctly identify GRP and CFRP as composite materials. It was noted however that failure to name a 'composite' did not appear to be a barrier to success in questions 1(b) and 1(c).
- 1(b)** The most popular responses linked GRP to products such as boats and CFRP to product such as tennis racquets, sports car bodies and bicycles.
- 1(c)** Most candidates were able to suggest appropriate properties with good explanations such as, CFRP being lightweight to allow the car to travel faster/ with better fuel efficiency, GRP being laid up to produce the single shell for the body of the boat. Generic statements such as, 'Strong to protect the driver in a car crash', 'durable for everyday wear and tear' and 'can be coloured' did not attain credit.
- 2** Some candidates showed a very good understanding of quality control methods such as visual inspections of materials, random sampling of parts to check sizes as well as the use of jigs and templates. Some candidates listed items of PPE or safety measures rather than quality control.
- 3** The quality of responses varied and in some cases showed a lack of familiarity with compliant materials.
- 4(a)** The majority of candidates could explain that a smart material's physical properties change in response to an input.
- 4(b)(i)** This question was well answered and the most popular smart materials and applications were thermochromic pigments for kettles, thermochromic sheets for thermometers and SMA for dental braces.
- 4(b)(ii)** In higher attaining responses the smart material properties were clearly linked to product use, e.g. thermochromic pigments change colour with heat, the kettle changes from blue to pink, letting the user know the kettle is hot. Lower level responses were unjustified and tended to be simple statements such as, 'shows it is hot'.

Section B

- 5(a)(i)** The majority of candidates were able to suggest a suitable metal, with stainless steel and aluminium being the most popular.
- 5(a)(ii)** Responses to this question were primarily well linked to product use and candidates made appropriate points such as 'corrosion resistant so will not rust if wet luggage is placed on it', 'malleable metal so it can be formed into the curved leg shape' and 'tough material will not shatter if the rack is knocked over'. Candidates did not attain credit for unexplained references to 'strong', 'durable' and 'cheap to obtain'.
- 5(a)(iii)** Although many candidates showed an appreciation of the rack being fabricated from lengths of round tubing, many seemed unfamiliar with the tooling required to carry out the processes. There were many simple references to 'cut to length', 'bend the metal', 'make a hole' and 'screw the legs together'. Higher attaining candidates were able to suggest specific tooling such as hacksaw, pipe bender, pillar drill and pop riveting and/or nuts and bolts. Many also showed clear diagrams with use of ends stops and jigs to aid manufacture.
- 5(b)** Candidates appeared to have a good understanding of health and safety, with many candidates making reference to risk assessments, provision of first aid and fire extinguishers, provision of PPE, training for the workforce, machine maintenance etc. Lower level responses tended to list items of PPE such as 'goggles', 'hard hats' and 'gloves'.
- 6(a)(i)** Candidates tended to answer this question well, showing good links why melamine formaldehyde is suitable for a kitchen work surface. Most popular responses centred around, 'chemical resistance to allow the worktop to be cleaned with detergent', 'thermosetting plastic which will not deform with heat so a hot pan will not burn the worktop surface', 'a hard material so will withstand scratches when cutting foods with a knife on the worktop' as well as references to specific aesthetic qualities such as pigmenting for different colours. Credit was not awarded to candidates who gave generic responses such as, 'easy to wipe, 'easily cleaned', 'cheap', 'can be coloured'.
- 6(a)(ii)** This question was not as well answered as 6(a)(i) and answers tended to contain far more generic, unexplained terms. Candidates did not attain credit for stating mahogany was 'strong' or 'able to take a finish' or for generic terms such as 'oil' and 'varnish'. Better answers made good reference to the grain and/or red brown colour making mahogany aesthetically pleasing, the ability to apply specific named finishes such as Danish oil or polyurethane varnish to provide a barrier against drinks spills and toughness to withstand impact from a dropped remote control.
- 6(b)** Again it was noted that this question contained many generic and unjustified responses such as 'cheap', 'strong' and 'available in many sizes'. Higher attaining candidates made justified statements such as, 'less expensive than the same size of solid timber', 'no grain problems as they do not contain knots like natural woods' and 'available in large sheet sizes unlike natural wood which is limited by the size of the trunk and would need planks glued together'.

Section C

- 7(a)(i)** This question was generally well answered and candidates demonstrated good use of technical language with a link to product use. The most popular were aspects such as HDPE's ability to be pigmented to produce a range of colours to attract the children, chemical resistance enabling it to be cleaned with detergent and impact resistance so would not break if the chair fell over in use. Unjustified statements such as, 'can be cleaned', 'can be coloured' and 'has a smooth finish' did not attain credit.
- 7(a)(ii)** Candidates did not generally score well on this question and although some recognised the link between UV light and colour fading/brittleness, few were able to suggest the use of stabilisers to prevent this.
- 7(a)(iii)** This was generally well answered and the higher attaining responses included aspects such as clear diagrams showing the shape of the final product, reference to the specific weight of polymer powder, a build-up of the wall thickness, an explanation of the specific chambers and the rotation on every axis. Lower level responses made reference to a polymer liquid being poured into a mould and the product simply being left to cool.
- 7(a)(iv)** The most popular hazards were heat from the machine, fumes from the plastic and risk of colliding with the large rotating machinery. Control methods were primarily appropriate to the identified hazard.
- 7(b)** Candidates generally showed a good understanding of ergonomic and safety aspects and many gave good evaluative statements. Most popular areas of focus were the slippery seat surface with the suggestion of added texture in the mould or the use of a TPE over the mould; sharp, pointed ears; the angle of the backrest being very upright and the seat length being too long for a two year old to use the backrest and have their legs curved over the end of the seat; the lack of arm rests for support when seated and the hard seating surface being uncomfortable for long use so incorporate some form of cushioning on the seat and backrest. Some good points were also noted about the one piece design and lack of detachable parts or finger traps. Lower level responses tended to focus on simple statements such as, 'the seat is uncomfortable' or 'it doesn't look the right size' with no further explanation.
- 7(c)** This question asked for developments relating to additional play and/or learning features and although the majority of candidates made very good proposals, some candidates decided to focus on improved ergonomic or safety features and many formulated responses to include additional storage. It was encouraging to see that very few candidates decided to re-design the chair and the focus was on development of the existing form. The better answers showed imagination and included shape sorting games, counting tasks and/or abacus, bead slider wire games, light up eyes and voice activation for good posture or links to animal shapes and noises when buttons were pressed. Many also discussed putting wheels on the feet so it could be a ride on toy with perhaps a tail for a pull along toy, sections of different textures such as furry spots, as well as incorporating smart materials such as thermochromic pigments to change colour when sat on and phosphorescent pigments for the chair to glow in the dark as a night light. Some lower level

responses tended to focus on single items such as making a holder for a tablet or a built-in screen.

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