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In this January examination paper, there has been a slight change to some of the questions in order to encourage more detailed responses, and provide more differentiation for candidates to demonstrate the depth of their knowledge. These changes have been focussed around sections B and C. The range of responses to these and the more familiar type of questions will be examined in this report.

Administration

A very large number of candidates made use of additional sheets, particularly in answering question 6(b). The one and half page space on the script should have been more than adequate for candidates to successfully answer the question. The material produced on additional sheets often repeated answers that were on the script and in many cases did not result in further marks being awarded. Centres are reminded that candidates need to write in black pen. Their handwriting should be legible.

- Q1 a (i)** The majority of candidates were able to name a specific smart material.
- Q1 a (ii)** Most candidates gave a correct product that the material can be used in. Typical responses included; kettles for thermochromic pigment and spectacle frames for shape memory alloy. The majority gave at least one reason why the smart material was used in the product. A significant number were not able to give two different reasons.
- Q1 b (i)** Quite a large number of candidates could not name a fibre based composite and gave incorrect responses instead such as a polymer or manufactured board.
- Q1 b (ii)** If candidates gave an incorrect response to part (i) but then gave relevant properties for the material and product they named in part (ii), they were able to pick up marks. **In future papers, the wording of such questions may be changed to prevent candidates doing this.**
Most candidates were able to name a suitable product for their chosen material. The most popular for CFRP centred on F1 racing cars or sports equipment. Better responses referred to laying up the CFRP for complex body shapes. A number of candidates were of the opinion that CFRP is to protect the car from impact in a crash or wrote 'good strength to weight ratio' with no further explanation. Fibre glass or GRP was also incorrectly named a number of times as a suitable material for house or car windows.
- Q2.** Responses to this question were quite mixed. Generally candidates gave either all correct answers or only two correct answers. Common errors were candidates choosing polymer dip coating for covering the car bumper.
- Q3. (a)** The pattern of responses to this question were similar to that of question two. Many candidates gave spot welding as a suitable process for joining tubular steel.
- Q3. (b)** Answers to this question were often quite basic and used generic phrases such as 'spot welding makes a strong joint'. Only a minority were able to give quality answers such as describing how dovetail joints have a large gluing surface area and interlocking/directional strength.
- Q4. (a) (i)** Good responses referred to grip qualities offered by TEP, the ability to be coloured to match the TV e.g. Sky trademark blue colours/ colour for different button functions, and durability from repeated use.
- Quite a large number of candidates described functional or aesthetic aspects of a remote control without any reference to the physical or mechanical properties of the material. Candidates also described inappropriate properties such as electrical insulation because of the risk of electric shock from the TV remote. Many stated that thermoplastic elastomer would be lightweight, ignoring the fact that TV remotes are thin and fairly small so weight would be negligible.

- Q4 (a) (ii)** Candidates generally gave good answers to this question although some were obvious or generic such as 'PLA is strong because it has to hold the weight of shopping'. Some candidates focussed purely on the function of the carrier bag rather than the suitability of the material for this use. Many candidates discussed recycling and missed the point that PLA is biodegradable.
- Q4 (a) (iii)** Responses to this question were generally less obvious than in previous years when this question has been used before. There were some good descriptions of the fact that card can be printed with graphics for branding and nutritional information. Good answers also included it is a compliant material that can be cut and scored, etc to make the 3D box construction. Weaker answers explained it was waterproof and that the card kept the drink fresh.
- Q4 (b)** The majority of candidates gave appropriate alternative materials such as LDPE and gave a description of a relevant physical or mechanical property, explaining its relevance to product function or manufacturing.
- Q5 (a)** Candidates generally gave an appropriate polymer for the fruit packaging. However, there are a significant number that gave inappropriate answers such as acrylic or PVC.
- Q5 (b)** As in Section A, some candidates gave an incorrect polymer in part (a) but then referred to relevant properties for the product and therefore picked up marks. **In future the wording of questions may be changed to avoid this situation.** Candidates described relevant properties for the plastic given in part(a), linking them to the function and making method of the product. Better answers tended to focus on food safe properties, transparency to allow the consumer to view the produce prior to purchase, thermoplastic being suitable for vacuum forming, thermoplastic suitable for recycling and the importance of this in short life cycle products.
- Q5 (c)** Most candidates appeared to give answers within the mid mark descriptor but the responses were very mixed. A number of candidates failed to recognise that the polymer had to be heated prior to forming. Some candidates got confused with the 'Bagpress' method of lamination as vacuum forming. In the best examples, candidates gave good, step by step descriptions with accompanying diagrams- the latter being labelled with correct terminology. At the top end of the mark range, candidates showed good knowledge, describing details such as the draft angle on moulds and blowing the softened sheet to stretch it before applying the vacuum.
- Q5 (d)** For this question there were some good responses linked to the 3Rs. Basic responses included making packaging from recyclable materials and generally reducing the quantity of material used. Better answers described the use of bio-based additives, the use of paper or card packaging that comes from FSC approved sources, or starch based materials.
- Q6 (a) (i)** The majority of candidates were able to give an appropriate thermoplastic for the play set pieces with ABS, HDPE and acrylic being the most popular.
- Q6 (a) (ii)** Generally, candidates were able to give three relevant properties and explained why the properties were relevant to the product. Most popular responses included ability to be pigmented for different coloured parts, durability, scratch resistance, impact resistance and non-toxic/chemical resistance in case the child put the toy in their mouth. Quite a large number of candidates described that the polymer would be lightweight and it needs to be because it would be lifted and handled by children. Clearly, they did not consider the toys would be small so would not be heavy anyway.
- Q6 (a) (iii)** To avoid confusion, candidates were told that the play set pieces were injection moulded. In previous examinations, candidates have produced excellent notes and diagrams of injection moulding. In this series, diagrams have been poor, labelled incorrectly and descriptions have missed or confused the stages of the process. Key

parts of the equipment such as Archimedean screw, hydraulic ram, ejectors pins, etc were missed.

- Q6 (a) (iv)** In most cases, candidates were able to explain at least two reasons why injection moulding is used in making the play set pieces. The majority recognised that the products would be made in large numbers and consistent quality would be required.
- Q6 (a) (v)** This question proved to be a little more difficult for candidates. Quite a few missed the point and described how the product would meet safety standards. The best responses described the use of feminine colours, flower forms, smiley faces, character designs, round shapes and so on. Some described the imaginative play value of the product due to interchangeable nature of the pieces.
- Q6 (b)** The responses from this paper indicate that this question has been more challenging for candidates than the final question in previous papers. In this series, candidates were required to develop the design shown in the illustration on page 18 of the question paper. The majority of answers simply inserted a clear window into the box, rounded the corners, added images of the toys and other items such as flowers, rainbows and stars that might be popular with the target market. The majority of answers selected laminated card as the main material and a polymer such as LDPE for the 'window'.

The best responses were more imaginative with their ideas. Some produced designs of environments such as 'houses' or similar with printed interior scenes to be used after purchase in playing with the figures. Quite a number of candidates included a vacuum formed liner with shaping for each assembled figure and spare parts. Some sketched and described re-usable containers made from more resistant materials. Creative designs incorporated carry handles, handbag designs and explained them to be like an adult/role model would have. Most described the use of bar codes for the retailer and safety labelling printed on card wrapping.

In the best answers describing the use of card, candidates gave details about specific types and grades. They often described how it might be printed, for example by using off-set lithography. Some candidates described DPI, finishing such as the application of varnishes or polymer film. Where a display window was included, a small number described the use of cut outs for children to touch the toy through the packaging.

Some candidates answered this as a process question and wrote at length about their selected manufacture process and focussed on why it would be suitable rather than developing the package.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the [Results statistics](#) page of the AQA Website.