



General Certificate of Education

Applied Science

8771/8773/8776/8779

SC05 Choosing and Using Materials

Report on the Examination

2007 examination - January series

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General Comments

Most candidates attempted every part of every question, indicating that they were able to complete the paper in the allocated time. As was the case in the June 2006 paper, the standard of mathematical calculations was very disappointing. Candidates should be encouraged to attempt all calculations: in many cases marks are awarded for selecting the correct equation or for providing the correct units, even if the arithmetic is faulty. Candidates should remember that when a question states 'use the information in the passage/table/graph', they should extract information from the appropriate source and not supply answers from their own general knowledge that are not included in the data provided. In some cases, it would appear that candidates would benefit from learning clear and precise definitions of standard terms that are given in the specification.

Question 1

- (a) Many candidates were able to obtain all 4 marks in this part.
- (b)(i) In spite of the fact that this was probably the simplest calculation on the paper, ($0.01 \times 1 = 0.01$), many candidates failed to obtain the correct answer.
- (ii) About half of the candidates managed to identify the correct equation to use, although not all of these were able to complete the arithmetic.
- (c)(i) Most candidates were able to identify the top part of the lintel as being in compression and the lower part as being in tension. Several candidates hedged their bets by labelling the steel reinforcing rod with both 'C' and 'T'.
- (ii) Many candidates failed to use the information from the table, which told them that concrete is weak in tension but steel is strong in tension.
- (iii) Many candidates failed to realise the importance of the position of the reinforcing rod within the beam, and thus provided answers such as 'to make it stronger'.
- (iv) Very few candidates realised that the shape of the beam had an important influence on its strength.
- (d)(i) Very few candidates were able to complete this calculation successfully.
- (ii) Most candidates were able to pick up about 4 of the 6 marks available here. However, some candidates failed to score because they had listed all of the properties for a particular material that were shown in the table, regardless of whether they were advantages or disadvantages.

Question 2

- (a)(i) Surprisingly, many candidates were unable to provide a simple definition of the term stress.
- (ii) Again, surprisingly, many candidates were unable to provide a simple definition of the term strain.
- (b) In spite of the fact that few candidates appeared to appreciate the meanings of the terms 'stress' and 'strain', most candidates knew that the Young modulus could be calculated by dividing stress by strain.
- (c)(i) Most candidates were able to identify part of the linear section of the graph as representing a section where the wire was behaving elastically. However, some candidates appeared to believe that they had been asked to identify the elastic limit, and thus indicated a point at the very end of the linear section.
- (ii) Most candidates were able to identify a suitable region of the graph that represented plastic behaviour.
- (iii) Only the better candidates were able to identify the yield point on the graph.
- (d)(i) Most candidates were able to work out a sensible scale for both axes, but many failed to note that the values for the strain were $\times 10^{-4}$ and that the units for stress were MNm^{-2} . A few candidates ignored the labels already on the graph and plotted stress and strain on the wrong axes. Most candidates were able to plot the points correctly and to draw a suitable line.
- (ii) About half of the candidates were able to identify the elastic limit correctly.
- (iii) Only the most able candidates were able to complete this calculation correctly. However, almost all of the candidates either omitted to include any units or suggested the wrong units. Candidates could have obtained a mark for inserting the correct units for area, even if their calculation was wrong.

Question 3

- (a) The majority of candidates realised that metallic bonding was the correct answer.
- (b) Most candidates were able to work out the correct order of the stages in the table.
- (c)(i) Most candidates knew the meaning of the word alloy.
- (ii) Most candidates were able to obtain a mark here, although the standard of the artwork varied widely. A few candidates failed to obtain a mark because they had not followed the instruction to label the different kinds of atom.
- (iii) Most candidates could provide a suitable method of treatment to make copper harder.
- (d)(i) Few candidates appeared to understand the meaning of the term 'brittleness'.
- (ii) Very few candidates obtained either of the 2 marks available here. Only a handful of candidates appeared to understand the principle of crack propagation.

- (e) Examiners saw some excellent answers here, with a significant number of candidates obtaining maximum marks. The idea of 'fair testing' seems to be well understood and appears to have been successfully carried forward from GCSE coursework. Sometimes candidates were struggling to suggest a suitable measuring instrument. A few candidates failed to understand the general principle of the experiment, with a significant number suggesting that the tube should be filled with water.

Question 4

- (a) Most candidates could obtain 1 out of the 2 marks here for suggesting a physical property that would be important.
- (b) Many candidates were suggesting a further physical property, perhaps indicating that they did not understand the meaning of the term 'physical property'.
- (c)(i) Most candidates were able to provide a suitable diagram showing that the fibres are parallel after cold drawing.
- (ii) Most candidates realised that this provided added strength to the nylon.

Question 5

- (a)(i) Most of the candidates knew the meaning of the term 'amorphous'
- (ii) Although many candidates could correctly suggest a type of ceramic material, others suggested an object rather than a material.
- (b)(i) Only the better candidates were able to score a mark here.
- (ii) Many candidates were able to score all 4 marks here, showing that they had correctly utilised the data in the table.
- (iii) Some of the definitions of 'thermal expansivity' were rather vague and ill-defined, although most candidates were able to score a mark for this. However, when it came to suggesting why thermal expansivity was important in this situation, very few candidates could put forward a suitable idea.

Question 6

- (a)(i) There were some very vague descriptions of the term 'composite material' although most candidates were able to earn a mark.
- (ii) The term 'stiffness' did not appear to be well understood.
- (iii) Many candidates responded to this question by stating 'strength means how strong something is'.
- (b) Most candidates were able to select from the passage the main difference between thermosetting plastics and thermoplastics.

- (c)(i) Most candidates were able to identify the single bond and the double bond, but only about half could identify the bonds as covalent.
- (ii) Most candidates found this question extremely difficult, with very few scoring any marks here.
- (iii) Some of the better candidates were able to score a mark for this question.
- (d)(i) About half of the candidates managed to identify information from the passage in order to answer this question correctly.
- (ii) About half of the candidates managed to identify information from the passage in order to answer this question correctly.
- (e) Most candidates realised that the purpose of the fibres in the matrix is to add strength.
- (f) Most candidates were able to score a mark here.
- (g) A pleasing number of candidates were able to score maximum marks on this question.

Mark Ranges and Award of Grades

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