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General Certificate of Education

Applied Science 8771/8773/8776/8779

SC05 Choosing and Using Materials

Report on the Examination

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General Comments

The majority of candidates attempted every part of every question.

Although the standard of literacy was generally of an appropriate level, the standard of numeracy, as shown by those questions involving calculations, was often below that expected of AS Level candidates.

Examiners were disappointed to find that those questions involving straightforward recall of standard definitions were very poorly answered by many of the candidates.

Question 1

(a) Most candidates realised that the thin layer of plastic was there to prevent the metal from corroding, although a few believed it was there to act as a heat insulator.

(b) Although many candidates were able to score at least one of the two marks in this part, many failed to read the rubric with sufficient care. It was therefore common to see answers that referred to physical or chemical factors, in spite of the instruction to the contrary.

Question 2

(a) This part of the question required candidates to *describe* what the graph was showing, i.e. the relationship between force and extension. In spite of this it was common to read answers that simply stated whether the material was behaving elastically or plastically.

(b) Most candidates were able to correctly label a point at which the wire was undergoing elastic deformation and a point at which it was undergoing plastic deformation. Some candidates however hedged their bets by labelling the transition point between the two.

(c) Very few candidates realised that when the force is removed the extension will decrease. Even fewer realised that the wire would be left with a permanent set.

(d) In parts (i) and (ii), examiners were disappointed to note that only about half of the candidates were able to quote a standard definition of the terms ‘stress’ and ‘strain’.

In part (iii) a common incorrect answer to the question as to why no units for strain were included in the table was ‘because strain has no units’.

In part (iv) most candidates were able to earn at least three or four marks for the graph. The most common reasons for failing to score all four marks were:

- failing to fully label the axes, including the correct units
- failing to notice that stress was $x10^{8}$ and that strain was $x10^{-3}$
- failing to attempt to draw a line

The calculations in parts (v) and (vi) were generally poorly done. Those candidates who correctly substituted the figures could often not go on to obtain a correct answer, mainly because of a weak grasp of dealing with indices.

In part (vii), many of the properties that candidates offered were not physical properties. This may have been either because the candidates failed to read the stem of the question with sufficient care or because they failed to appreciate the meaning of the term 'physical property'.

Question 3

(a) The better candidates were able to identify the structure as being crystalline, but the less able candidates failed to do so.

(b) Very few candidates could identify the type of bonding as metallic. The most common incorrect answer was 'covalent'.

(c) Very few candidates appreciated that the dislocation had been caused by a missing copper atom, and that this dislocation would run through the structure.

(d) Most candidates knew the meaning of the term malleable, and were able to suggest a suitable process by which copper can be treated to increase its hardness.

Question 4

(a) The majority of candidates were able to earn both marks in this part.

(b) In part (i), most candidates could provide an acceptable meaning of the term 'alloy'.

In part (ii), most candidates could provide suitable advantages and explanations for using aluminium alloy and steel alloy for the bicycle frame. They were however less convincing when it came to the titanium alloy.

In part (iii) the main reason why candidates failed to score a mark appeared to be the lack of understanding of the term 'physical factor'.

Part (v) was generally answered well. The most common error was to try to calculate the volume of the tube by measuring the external diameter and then calculating $\pi r^2 \times$ length, rather than by using a displacement of water technique.

(c) Only the better candidates were able to select the correct graph in part (i).

In part (ii) very few candidates could suggest a property of rubber that made it suitable to use for bicycle tyres.

In parts (iii), (iv), (v) and (vi) examiners were disappointed to see that very few candidates could offer a standard definition of the terms 'thermal expansivity' and 'thermal conductivity'. It was perhaps therefore not surprising that few candidates could suggest why these two factors should be important.

Question 5

(a) Most candidates could offer a suitable meaning of the term 'composite material.

(b) Most candidates were able to score one mark here, but few noted the protective nature of the thin layer of plastic.

(c) Only the better candidates were able to answer in terms of the direction in which the grain was running in the wood.

(d) The majority of candidates were able to identify correctly both a region of compression and a region of tension in the shelf.

Question 6

Most candidates were able to score three or four marks on this question. The most common techniques used were either to drop the bolt from successively greater heights until the paper broke or to use more or heavier bolts from the same height. A few candidates failed to understand the general principle of the experiment, and a few made no attempt at an answer.

Question 7

(a) This was well answered by most candidates. A few less able candidates chose a wire that had a very low value of electrical conductivity. The reason that they gave for this choice was that they did not want people touching the fire to be electrocuted.

(b) Hardly any candidates could give the correct unit for electrical conductivity.

Question 8

(a) In part (i), very few candidates could provide a satisfactory explanation of the term 'strength-to-weight ratio'.

Perhaps because candidates were simply taking strength-to-weight ratio to mean simply 'strength', many candidates were able to score marks in parts (ii) and (iii).

(b) In part (i) most candidates appreciated that it was covalent bonding, but fewer mentioned the fact that there was a double bond. The fact that the mark allocation was shown as '*2 marks*' should have alerted them to the fact that more than a one-word answer was required.

In part (ii) only the better candidates were able to earn any marks for an explanation as to how the two monomers join together; of these, very few earned more than one mark.

In part (iii) most candidates wrongly wrote that the type of bonding involved was covalent.

(c) Only the better candidates appeared to be able to offer a suitable line on the graph.

(d) Many of the answers seen here were very vague, with hardly any candidates noticing the instruction 'using the idea of pressure'.

(e) Most candidates were able to offer a suitable suggestion here.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the **Results statistics** page of the AQA Website.