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Applied Science SC05

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Unit 5: Choosing and Using Materials

Report on the Examination

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General Comments

The paper appeared to differentiate quite well and produced a good spread of marks. The vast majority of students attempted every part of every question.

It was pleasing to see that the standard of mathematical calculations has continued to improve. Students should be encouraged to attempt all calculations: in many cases marks are awarded for selecting the correct formula to use and for providing the correct units, even if the arithmetic is faulty.

It was also pleasing to see that those questions involving straightforward recall of standard definitions were again answered reasonably well by many students. This has been a weakness of most students in the past.

Once again, the comprehension question (question 5) was poorly answered. It is recommended that schools/colleges practise the comprehension question with their students using past papers and mark schemes.

Question 1

(a) This part of the question was very well answered.

(b) This part of the question had fewer correct responses than part (a).

Question 2

(a) The graph for this question, on the whole, was well drawn, with the axes in the correct place, correctly labelled and with correct units and suitable scales. However, it is disappointing to see that a small number of students do not know the *x*-axis from the *y*- axis.

(b) This question was very well answered.

(c) Many students stated the simple relationship between the two quantities and so scored 1 mark. Only about one-third of students went on to say that the quantities were directly proportional.

(d)(i) The following three questions were poorly answered. It appears that the information that can be deduced from load–extension graphs concerning ductility, stiffness and strength of materials is not well known by the majority of students.

(d)(ii) See (d)(i).

(d)(iii) See (d)(i).

Question 3

(a) The definitions of malleability and brittleness were reasonably well known.

(b) Surprisingly, about 40% of students did **not** know that steel is an alloy.

(c) Only half of all students scored on this question.

(d)(i) The majority of students could describe the quenching process in this part of the question.

(d)(ii) Not all students could go on to state other properties (apart from hardness) that the process affected.

Question 4

(a) Just over half of all students scored on this question. The most common **incorrect** answer was to say that a polymer is a 'long chain <u>of</u> molecules' rather than a 'long chain molecule'. (A long chain <u>of</u> monomers was accepted).

(b) The meaning of the term 'amorphous' was known by a vast majority of students.

(c) The majority of students scored 1 mark out of 3 but very few students obtained full marks.

(d)(i) The majority of students scored on this question.

(d)(ii) Only about a quarter of all students could describe the annealing process for toughening glass.

(e) This question was answered well with 70% of students scoring half marks or more. A few students thought that the displacement procedure used to obtain the volume of an irregular shaped object actually gave the value for the density.

Question 5

(a) About half of all students could select from the article the information needed to answer these questions.

(b) As above.

(c) Only four students scored all 4 marks on this question. The majority of students did manage to score at least 1 mark. With the exception of 'plastic deformation' the definitions of the other terms were not well known.

(d) A lot of answers did not make a comparison between the two materials. For example, by stating that the carbon nanotube frame would be light instead of saying it would be light<u>er</u> than a steel frame.

(e) The majority of students answered this question well.

Question 6

(a)(i) Only about half of all students could explain the meaning of the term 'strong in compression'.

(a)(ii) Only about half of all students could explain the meaning of the term 'weak in tension'.

(b)(i) The majority of students correctly indicated the part of the concrete beam in compression in this part of the question.

(b)(ii) In this part of the question only about a quarter of all students could state the reason for the steel rod being in the lower half of the beam.

(c)(i) The vast majority of students scored at least 1 mark on this question.

(c)(ii) A poorly answered question. Only a few students realised that the purpose of the steel was to make the PVC window frame more rigid.

(d) The vast majority of students scored at least 1 mark on this question.

(e)(i) Most students gave an answer of 38%, i.e. the percentage of lead. The question asked for the percentage of tin (100 – 38 = 62%).

(e)(ii) Only about one third of all students obtained full marks. A large number of answers gave the correct percentages of lead and tin required but failed to go on to convert these percentages into masses.

Question 7

(a) The definitions of *stress* and *strain* were very well known.

(b)(i) A lot of students made this question more complicated than necessary. The answer was a 'ruler'.

(b)(ii) Very badly answered. Nearly all students said 'subtract original length from extended length to obtain the extension'. The question asked for a description of how the extension would be **measured**.

(b)(iii) Only about a quarter of all students stated that the deformation of the wire was elastic.

(b)(iv) A badly answered question. About half of all students did not score at all.

(b)(v) A handful of students obtained full marks for the Young modulus calculation. Of the rest, a good majority obtained one compensation mark for stating the correct formula for Young modulus. A good proportion of students also scored a second compensation mark for a correct value / substitution for either stress or strain. A lot of students omitted the unit for Young modulus and a common error was to write 'Nm^2' instead of Nm^{-2} or N/m^2.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the Results Statistics page of the AQA website.