



General Certificate of Education

Applied Science

8771/8773/8776/8779

SC08

Medical Physics

Report on the Examination

2009 examination - June series

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General Comments

Some centres have clearly done an excellent job in preparing candidates for this examination, however, during this series, there were a substantial number who were poorly prepared. Many candidates knew a few 'key phrases' but seemed to have little understanding of the basic concepts on which this unit is based and therefore had difficulty in addressing questions that required understanding or application of knowledge in new contexts. This resulted in confused explanations and serious difficulties in applying knowledge in different contexts.

There is still confusion between radioactivity and X-rays, little understanding of half-life and very few candidates had any idea of how to carry out an experiment to measure the half-life of a material or even of what practical safety measures would be carried out in school or college when working with radioactive substances. Some of the answers given to Question 6 were very poor. It is important that candidates do have the opportunity to carry out or see demonstrations of laboratory experiments related to the theory in this unit. There will always be at least one question, and about 10% of the marks for this paper, based around standard laboratory experiments and candidates need to be prepared for this.

The other main problem arose from a failure to read the questions properly. There were a number of examples where the answers given did not relate at all to the question that was asked.

Question 1

- (a) All parts were generally done well however there were some centres where few candidates knew the range of normal body temperature.
- (b)(i) Very few candidates gained both marks giving only very vague explanations. Many answers stated (or could be summarised as) 'When it gets hot it rises' which does not demonstrate knowledge of physics and failed to gain credit.
- (ii) Few candidates gained these marks. Most seemed to think the question was about the constriction.
- (c)(i) Generally well done.
- (ii) Generally well done.

For both of the above, however, some candidates had a tendency to list a number of possible reasons, some of which were completely spurious and could lead to negation of valid answers. These included the statement that it was more accurate (where there is no evidence for this statement) or that it monitored continuously (for which there was also no support).

- (d)(i) Very few candidates knew how to answer this part of the question.
- (ii) Even fewer candidates were able to explain how an electronic thermometer measured temperature.
- (e) Poorly answered because many candidates did not address the question. Instead of saying which factors could affect the accuracy of an electronic thermometer they wrote about why electronic thermometers were more accurate than liquid-in-glass thermometers – and the reason given for this was usually not valid.

Question 2

- (a) Generally done well.
- (b) In some centres most candidates answered this correctly but in other centres few candidates knew what any of the specific isotopes were used for.
- (c) Most candidates gained the mark for noting that the implant would not need to be changed frequently but few gained the second mark which related to ensuring a constant activity level throughout treatment.
- (d)(i) Generally correct though a number of answers were very poorly expressed.
- (ii) About half of candidates answered this correctly. Most gained some credit for using an iterative method, realising that activity needed to be repeatedly halved.
- (iii) Most candidates gained the safety related mark but few noted that activity needed to be kept at a sufficiently high level for an effective trace to be carried out – responses being too vague to gain credit.
- (e)(i) Most candidates gained at least one mark here.
- (ii) Few candidates demonstrated an understanding of either ‘toxicity’ or ‘daughter product’.
- (f) Few candidates gained this mark.

Question 3

- (a) Generally quite well answered though some answers were not specific enough to gain all 3 marks.
- (b)(i) Some candidates produced very clear, logical answers correctly using the terms given. Others demonstrated very little understanding of how ultrasound imaging takes place. Acoustic impedance was poorly understood and a significant number of candidates talked about gel being used on the skin to improve electrical conductivity – an issue that has been raised in a number of previous examiner’s reports.
- (c)(i) About half the candidates gained both marks. Most gained the mark relating to ultrasound using differential reflection but many candidates also thought X-rays used reflection to produce images.
- (ii) Most candidates gained at least one mark. Some failed to gain further marks because they were unable to express their ideas clearly.
- (iii) Few candidates could explain either of these terms sufficiently well.
- (iv) Most candidates gained at least one mark however a substantial number did not address the question asked, for example giving examples of the type of damage that can be caused by overexposure to X-rays.
- (d) Most candidates knew the correct equation to use but some had difficulty in re-arranging it correctly and many failed to calculate the correct power of ten. Some candidates also failed to get full marks because they simply wrote down what their calculator display showed, i.e. 1.5^{-11} rather than interpreting this into the correct number 1.5×10^{-11} .

- (e) About half the candidates gained this mark. Many others candidates submitted responses which did not address the fact that it was completely non-invasive.

Question 4

- (a)(i) Most candidates gained all 3 marks. Some failed to gain marks because their graph was too small. There were still a few candidates who did not draw even scales or failed to draw any line.
- (ii) Most candidates gained two of the three available marks. Marks were not gained as candidates failed to find two values and average them for accuracy or for failing to give units with their answers.
- (b)(i) Few candidates seemed to understand what this question was about and were therefore able to suggest a suitable use for the material. A substantial number of candidates thought his was about half-life not half-thickness.
- (ii) Most of the candidates who understood the context of the question gained this mark.

Question 5

- (a) Most candidates gained 2 marks. Lack of explanation led to the failure to score higher. Also some candidates demonstrated very little understanding of how this monitoring might currently be carried out which led to them producing simplistic suggestions.
- (b)(i) About half the candidates gained this mark. Others seemed to have the right idea but produced incorrect variations of the term and the mark could not be awarded.
- (ii) Most candidates achieved this mark.

Question 6

- (a)(i) Few candidates gained this mark. Incorrect additional equipment was suggested and few included a timing device.
- (ii) Most candidates gained this mark
- (iii) Very few candidates gained both marks. A few gained the mark for ensuring validity but very few stated that the count rate / counts per minute needed to be measured. This meant that the vast majority of candidates scored zero. Some candidates had completely misunderstood the question and were suggesting experiments where radioactive sources were ingested by human subjects.
- (iv) Most candidates chose an appropriate time interval so gained one mark. Few were able to explain why this time interval had been chosen.
- (v) About half of all candidates gained one mark. Very few gained both.
- (vi) Only practical suggestions were accepted. In some centres most candidates gained both marks in other centres few gained any marks. Practical experience of radioactivity experiments would make these marks very easy for candidates to access.

- (b)(i) Candidates who had read the question properly generally gained this mark. Others discussed radioisotopes within humans which was not a context suggested anywhere within the question.
- (ii) This was a difficult question but was well answered by most candidates who had read the question properly.

Mark Ranges and Award of Grades

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