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ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Education

Applied Science 8771/8773/8776/8779

SC08 Medical Physics

Report on the Examination

2009 examination – January series

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General Comments

One of the most striking impressions from marking this paper was that there was a substantial base of students who were very well prepared and who had a good understanding of medical physics principles but that there were also many candidates who had learned a lot of facts but who had very little understanding of the basic concepts on which this unit is based. This resulted in confused explanations and serious difficulties in applying knowledge in different contexts.

There was clear confusion between radioactivity and X-rays (e.g. "X-rays contain gamma radiation"), the process of carrying out electrocardiograms and the process of carrying out ultrasound scans (e.g." Gel is applied to the body so that sound waves aren't reflected and so electrical signals can pass through more easily").

The questions on optical fibres also showed a lack of understanding of the terms refractive index and critical angle (e.g. "The refractive index is bigger than the critical angle".) It is recommended that candidates spend more time ensuring they understand what they have been taught rather than just remembering terms that they don't know how to apply correctly.

The greatest disappointment was the response to question 5 – a basic experiment to measure refractive index. Most candidates failed to score more than one or two of the 6 marks available. Most did not know where the angles of incidence or refraction were. This is very basic physics.

The mathematical aspects of the paper were generally done quite well though most candidates had great difficulty with using sines. Question 3(c)(i) was done very poorly – many candidates could not extract the correct value to put into the equation even when the equation was known.

Question 1

(a) All parts were generally done well.

(b)(i) Generally correct.

(ii) About half the candidates got this right; others thought the problem would be that movement would raise the heart/pulse rate which was not credited.

(iii) A lot of confusion between this gel and the coupling agent used in ultrasound scanning.

(iv) Generally very poorly answered.

Question 2

(a) Generally done well.

(b)(i) Few candidates scored marks here because they did not follow the instruction to use the data in the table to answer the question. Answers that did not involve specific acoustic impedance were not credited.

(ii) Almost all candidates extracted the correct data, most knew the correct equation but very few gained all four marks – usually due to forgetting to square.

(c) Most candidates gained two marks. Many candidates, however, did not answer the question set and actually explained why ultrasound was more suitable than X-rays for this application and hence did not give the information required to gain full credit.

Question 3

(a)(i) Generally quite well answered though some candidates thought that electrical signals were transmitted and many did not discuss the reflection of light back up the fibre.

(ii) Generally well answered.

(b)(i) Generally well answered.

(ii) Generally well answered but “goggles” or “safety goggles” alone are insufficient to gain the mark for suitable eye protection as they imply normal laboratory safety glasses which would not protect against laser light.

(iii) Most candidates gained the full 2 marks.

(c)(i) Hardly anyone gained any marks here. This was due to not stating the equation and not selecting the correct values, e.g. writing " =1/sin56”.

(ii) Most candidates recognised the correct answer and were able to link this to refractive index and/or critical angle.

Question 4

(a) All parts were generally answered well.

(b)(i) Most candidates gained 3 or 4 of the 5 available marks.

(ii) Generally answered very well.

(c)(i) Most candidates gained the full two marks.

(ii) Very variable answers. Some candidates answered this very well others thought it was about radioisotope being present inside a patient and completely missed the point of the question. Other spoke about the “half-life getting less” as time went on, which suggested that they did not understand what half-life was, despite having gained the mark for this definition in (a)(iii).

(d)(i) Generally correct.

(ii) Most candidates were able to state that there would be less of the isotope remaining but many thought that this was because it was being used to treat the cancer – which is irrelevant and did not gain credit.

(iii) A variable response here. Not all candidates seemed to understand the question.

(iv) Generally answered well.

Question 5

(a)(i) Most candidates gained this mark.

(ii) Most candidates gained this mark though some did not because they failed to include a light source.

(iii) Hardy anyone was able to label the two angles and the normal correctly.

(b)(i) Very few candidates gained this mark.

(ii) Very few candidates gained any marks here. Most described fair testing not actions to ensure accuracy.

Question 6

(a)(i) Generally correct.

(ii) Generally correct though some candidates thought infrared radiation was sent into the body when a thermograph was produced.

(b) Very few candidates gained marks here because they failed to explain the advantages they stated and each mark was for stating and explaining a separate advantage.

Mark Ranges and Award of Grades

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