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General Certificate of Education

Applied Science 8771/8773/8776/8779

SC08 Medical Physics

Report on the Examination

2008 examination - January series

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General Comments

This examination was generally addressed quite well but there are still some basic misconceptions that need to be addressed, particularly in relation to X-rays and radioactivity. Unfortunately there were a number of candidates who seemed to be completely unprepared for this examination and did not seem able to recall even basic information.

The question on experiment design was addressed more effectively than has previously been the case but many candidates failed to use all the information in the question and therefore limited the number of marks they could score.

Mathematics continued to be a problem for a substantial number of candidates.

Question 1

(a)(i) Generally correct.

(ii) Any answer that indicated a change in the traces compared to the normal traces was accepted.

(b)(i) Generally correct.

(ii) Most candidates gained at least one mark here but many candidates did not seem aware that the gel was to improve **electrical** conductivity. Many candidates confused the use of gel in this scenario with the use of an acoustic coupling gel when ultrasound scans are performed. This has been an area of confusion in previous papers too.

Question 2

(a) Most candidates realised that X-rays were high frequency waves but some candidates thought they were longitudinal.

(b) Most answers were too generalised to gain marks. Few candidates included reference to different densities and hence different levels of absorption in their responses.

(c) Generally answered correctly.

(d) Most candidates had the right idea here but many did not give specific enough responses to gain full credit.

(e)(i) Most candidates referred to X-rays being dangerous. Surprisingly few made the point that thermography involves absolutely being sent into the body and therefore it was not possible for it to be dangerous at all.

(ii) Most candidates gained at least one mark here. Incorrect references to X-rays being cheaper that thermography were not credited.

(f) Most candidates gained at least one mark here.

Question 3

(a)(i) Almost all candidates knew the patient's blood pressure was below normal.

(ii) Most candidates gained both marks here though some thought the numbers related to pulse rate.

(b) Most candidates gained at least two marks here but failed to get full marks as explanations were not sufficiently precise.

(c)(i) About half of candidates gained this mark. Those who said the cuff needed to be near the heart, rather than level with the heart, were not given credit.

(ii) Few candidates realised that the blood pressure measurement would be higher at the ankle.

(d) Most candidates gained at least two marks here, many gaining the full four marks available. Some candidates, however, talked about the nurse counting the number of pulses detected in a given period of time – confusing blood pressure with pulse rate.

Question 4

(a) Most candidates gained between two and four marks on this question. Several candidates stated 'use of keyhole surgery' as an advantage which was not creditworthy as both methods being compared used keyhole surgery. This is an example of where the candidates would have benefited from a more thorough reading of the information supplied at the start of the question.

(b) Most candidates answered this correctly.

(c) Most candidates gained at least two marks here.

(d)(i) Generally correct.

(ii) Generally very poorly answered. Many candidates wrote about how the endoscope was used rather than discussing the physical principles behind how it operates. Those who did attempt to answer the question as written often gave very vague responses which gained very little credit.

(e) About half of the candidates answered this correctly. Many said that the 'keyhole' wasn't big enough so more than one incision had to be made – which would remove the advantage using keyhole surgery in the first place.

Question 5

(a)(i) Generally correct.

(ii) Many candidates had problems rearranging the equation appropriately and consequently failed to gain marks here.

(b) Many candidates failed to recall this equation and hence failed to gain any credit in this part of the question. Most who recalled the equation also substituted correctly and hence also gained the second mark. Many, however, then failed to process the numbers correctly so failed to gain the final mark.

(c)(i) Few candidates answered this correctly.

(ii) Few candidates answered this correctly.

(d) Most candidates gained at least one mark here.

Question 6

(a) Most candidates gained at least three or four marks. These were generally for selecting an appropriate detector, setting up the experiment appropriately and for mentioning an appropriate safety measure. However, most candidates then ignored the information given at the start of the question regarding the fact that the isotope was a beta emitter and went on to say how you could tell what type of radiation the isotope emitted – which would not gain credit. This indicates the need for candidates to read the stem of the question more thoroughly and to keep referring back to it to check what information has been given and what the question is actually asking the candidate to write about.

(b) Most candidates gained one or two marks here. There were clearly some misconceptions though, for example, several candidates, from a range of centres, suggested that all beta emitters have a short half-life. This is incorrect and indicates an important misconception about the relationship between half-life and type of radioactivity emitted.

(c) Most candidates suggested a suitable half-life and gained one further mark. Several candidates, however, commented that a half-life of, say, three months, was short enough for the patient to not remain radioactive for too long which suggests a misunderstanding.

(d)(i) Most candidates answered this correctly. Of those who did not get the correct answer, almost all used a correct method and therefore gained one mark.

(ii) Most candidates gained two marks here. Almost all gained at least one.

(e) This was surprisingly poorly answered bearing in mind that the specification clearly lists the reasons why technetium-99 is widely used. We would expect candidates to have learned this list.

Mark Ranges and Award of Grades

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