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Applied Science SC08

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Unit 8: Medical Physics

Report on the Examination

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General Comments

As usual, some centres prepared candidates extremely well for this examination. There were a substantial minority of candidates, however, who were not prepared for this paper and who did not seem to know the basics of the Specification. This was evident when candidates did not know what basic monitoring equipment was used for, what X-rays are, what 'diagnosis' means or what a tracer is used for.

It was very pleasing to see that candidates, on the whole, were able to describe standard lab experiments much more fully and accurately than in previous years. It was worrying; however, that many candidates were not familiar with safety precautions to be taken when using radioisotopes in a school or college laboratory. The standard of written communication overall, and particularly in the QWC questions was also higher than it has been in the past.

Question 1

(a) Was generally completed well though some candidates confused tachycardia and bradycardia.

(b) This was generally correct though a surprising number of candidates stated blood pressure values rather than pulse rate.

(c) Most candidates had correct answers for all three parts of this question but a surprising number did not.

Question 2

(a) Most candidates answered this correctly.

(b)(i) About 50% of candidates were able to name all three featured parts.

(ii) Most candidates had the right idea but many failed to gain this mark because they said that X-rays, rather than electrons, were attracted to the anode. Many candidates thought that the anode acted as a fan which showed that they had not realised the implications of the tube being evacuated.

(iii) Very few candidates recognised that the only possible transfer mechanism was radiation as the anode is in a vacuum.

Question 3

(a) Most candidates gained this mark but some failed to do so either because they did not know what diagnosis meant or because they said it also included treatment. It was clear that for a substantial number of students, the difference between diagnosis and therapy is not clear.

(b)(i) & (ii) Most candidates scored in each of these parts.

(iii) Almost all candidates gained this mark.

(iv) Few candidates could explain what 'stochastic' meant. About half explained 'somatic' sufficiently well to gain this mark.

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

(ii) Most candidates gained two marks. Very few stated that the degree of contrast depended on the difference in density between the media and hence did not gain the third mark.

(d) This was answered very well with most candidates gaining 3 or 4 marks.

Question 4

(a)(i) Most candidates explained this sufficiently well to gain the mark. Common errors included talking about the time taken for an atom to halve or 'half the time it takes the activity to decay'.

(ii) Most candidates gained at least one mark with a substantial number gaining both marks. However, some failed to score because they doubled the time interval each time they halved the activity (e.g. 12, 24, 48 hours rather than 12, 24, 36, 48 hours).

(iii) Most candidates gained at least one mark.

(b) Most candidates gained at least one mark.

(c) Most candidates gained at least two marks. Common errors included talking about gamma rays passing out of the body without being clear that they meant through penetrating the skin rather than by excretion.

(d) Most candidates gained at least 2 marks. Some failed to score because they did not read the question properly and gave answers related to half-life and type of radiation emitted.

Question 5

(a) This question was generally answered well by candidates who had thought about the passage. Most candidates gained 3-5 marks overall and gave sensible suggestions. Almost all candidates who attempted this question gained some marks and a substantial number gained full marks.

(b) Most candidates gained this mark.

Question 6

(a) This was generally quite well done. Most candidates identified suitable equipment and a generally suitable method though there was a tendency not to explain in detail how you could be sure that beta radiation was the only type of radiation being emitted. It was worrying, however, that some candidates actually suggested using their hand as a shield to check whether the radiation emitted would pass through it.

(b) This was generally done well with most candidates gaining both marks. Comments relating to the accuracy of the equipment or human error when carrying out the experiment did not score.

(c) Most candidates gained at least one mark. Marks were generally lost because candidates suggested precautions that were unrealistic in the school/college setting e.g. wearing lead-lined clothes, working in a lead-lined room, wearing a film badge etc. Vague references to general protective equipment, e.g. lab coat, goggles, gloves, also did not score. It was worrying to see a number of candidates thought it was safe to pick up sources if wearing gloves.

Question 7

(a) Most candidates had the right idea and linked this with TIR but many failed to score because they did not state that it was the **minimum** angle of incidence for which TIR would occur.

(b) This was generally done well with most candidates gaining at least 2 marks.

(c) This was done quite well with most candidates scoring 1 or 2 marks and a significant number scoring full marks.

(d)(i) This was generally correct.

(ii) Few candidates gained this mark.

(e) Both parts of this question were generally done well.

Question 8

(a) This was generally done well. Almost all candidates gained at least one mark and the majority gained both.

(b) Both parts were generally done well but there were a substantial minority of candidates who referred to electrical conductivity which is completely inappropriate in this context.

(c) This was generally done quite well though many candidates failed to mention how different types of tissue or different depths of tissue were distinguished. I was pleased to see better use of technical language this year than in previous sessions, e.g. ‘reflected’ rather than ‘bounced off’.

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