



General Certificate of Education

Applied Science **8771/8773/8776/8779**

SC08 Medical Physics

Mark Scheme

2007 examination - January series

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Question 1

(a)	Uses (conductive) gel	(1)(AO1)	1
(b)	Any two of: (one mark each) <ul style="list-style-type: none"> • Interference • Movement produces electrical impulses • Electrical impulses in nerves/muscles 	(2)(AO2)	2
(c)(i)	Theta	(1)(AO1)	1
(ii)	Mental activity	(1)(AO1)	1
(iii)	Deep sleep	(1)(AO1)	1

Total Mark: 6**Question 2**

(a)(i)	One mark for each correct label	(4)(AO1)	4
(ii)	Rotates Reduce number of electrons Hitting the same point Other valid answers accepted	(1)(AO2) (1)(AO1)	2
(b)(i)	Any suitable precaution E.g. shielding other areas	(1)(AO1)	1
(ii)	Suitable explanation linked to precaution stated.	(1)(AO2)	1
(iii)	Any suitable condition E.g. cancer, burns, genetic damage	(1)(AO1)	1
(iv)	Stochastic – extent of damage depends on amount of radiation received Somatic – not inherited	(1)(AO1) (1)(AO1)	2
(c)(i)	Well defined images	(1)(AO1)	1
(ii)	Contrast media used Increase difference in density/absorption Appropriate answers relating to exposure time and/or energy of X-rays accepted.	(1)(AO1) (1)(AO1)	2
(d)	Any two suitable reasons e.g. <ul style="list-style-type: none"> • Cheaper • Quicker • More machines available • More trained personnel available • Lower dose of radiation/safer 	(1)(AO1) (1)(AO1)	2

Total Mark: 16

Question 4

(a)	1.35 Allow 1.3 – 1.4 Allow 1 mark compensation for: Correct equation Correct substitution or correct use of sines Maximum 2 compensation marks	(3)(AO2)	3
(b)(i)	Correct diagram showing ray <ul style="list-style-type: none"> emerging into the air bending away from the normal 	(1)(AO2) (1)(AO2)	2
(ii)	Correct diagram showing ray <ul style="list-style-type: none"> totally internally reflecting angle $i = \text{angle } r$ (by eye) 	(1)(AO2) (1)(AO2)	2
(c)	Any four of: (1 mark each) <ul style="list-style-type: none"> TIR only when angle $> c$ Endoscope uses TIR High $n = \text{low } c$ More chance of reflection when c is small More chance of reflection when n is large If angle $< c$ ray emerges into air More rays reflecting gives brighter light 	(4)(AO2)	4
(d)(i)	To keep the refractive index constant OR prevent light being lost	(1)(AO1)	1
(ii)	(Slightly) lower	(1)(AO1)	1
(e)	Any suitable condition e.g. stomach ulcers	(1)(AO1)	1

Total Mark: 14**Question 5**

(a)	Sound/longitudinal waves Higher frequency than audible/above 20kHz	(1)(AO1) (1)(AO1)	2
(b)(i)	Any two points (1 mark each) e.g. <ul style="list-style-type: none"> Removes air Improves transmission Reduces reflection At surface of body Minimises density difference 	(2)(AO1)	2
(ii)	Any 4 correct points in sequence (1 mark each) e.g. <ul style="list-style-type: none"> When they hit tissue of different density They are reflected Reflections occur at different times Different tissue densities produce different intensity reflections (Transducers) detect reflections Reflections analysed Image created from analysis 	(4)(AO1)	4
(c)(i)	Heat (radiation) emitted from the body Detected by camera/film/electronic detectors	(1)(AO1) (1)(AO1)	2
(ii)	Nothing enters the body	(1)(AO2)	1

Total Mark: 11

Question 6

(a)(i)	Above normal	(1)(AO1)	1
(ii)	(145) Systolic/in systole (or wtte) (90) Diastolic/in diastole (or wtte)	(1)(AO1) (1)(AO1)	2
(b)	Any suitable advantage for 1 mark e.g. <ul style="list-style-type: none"> • Less chance of infection Any suitable disadvantage for 1 mark e.g. <ul style="list-style-type: none"> • Less accurate • If using invasive method can remove blood for other purposes without having to put another line into the artery. 	(1)(AO1) (1)(AO1)	2
(c)	Method B (no marks) Can monitor continually Can have audible warning (Other sensible reasons accepted)	(1)(AO2) (1)(AO2)	2

Total Mark: 7