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ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Education

Applied Science 8771/8773/8776/8779

SC08 Medical Physics

Mark Scheme

2008 examination – January series

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Question 1

(a)(i)	Brain	(1) (AO1)	**1**
(ii)	Shape of trace changes (owtte)	(1) (AO2)	**1**
(b)(i)	Heart	(1) (AO1)	**1**
(ii)	Improve conductivity (allow remove air) Electrical (conductivity)	(1) (AO1) (1) (AO1)	**2**

Total Mark: 5

Question 2

(a)	High frequency/high energy/short wavelength Electromagnetic/transverse waves	(1) (AO1) (1) (AO1)	**2**
(b)	Different density (So) different absorbtion/attenuation	(1) (AO2) (1) (AO2)	**2**
(c)	(Records) heat Emitted (from the body)	(1) (AO1) (1) (AO1)	**2**
(d)	Different amount of heat emitted (So) different colour shown on thermograph OR different from normal thermograph	(1) (AO2) (1) (AO2)	**2**
(e)(i)	Non-invasive X-rays are dangerous/ionising/damage cells (allow converse) As nothing enters body no damage can be caused	(1) (AO2) (1) (AO2) (1) (AO2)	**3**
(ii)	X-rays have proven track record So less likely to miss a tumour OR More established /accessible So more machinery/trained personnel Two reasons without expansion also accepted. Sensible alternative suggestions accepted.	(1) (AO2) (1) (AO2)	**2**
(f)	Any two sensible reasons. E.g. Very high energy / more damaging Much more expensive / too expensive Takes too long Fewer machines Harder to have portable units More training needed	(1) (AO2) (1) (AO2)	**2**

Total Mark: 15

Question 3

(a)(i)	Below normal	(1) (AO2)	**1**
(ii)	Systolic Diastolic	(1) (AO1) (1) (AO1)	**2**
(b)	Any sensible reason Explained Any sensible second reason Explained e.g. Patient is less anxious so b.p.is less affected by anxiety or Less risk of infection as nothing enters the bloodstream	(1) (AO1) (1) (AO2) (1) (AO1) (1) (AO2)	**4**
(c)(i)	To be level with the heart	(1) (AO1)	**1**
(ii)	It would be greater	(1) (AO2)	**1**
(d)	Any four sensible points in logical sequence: E.g. Tightens cuff Stethoscope on arm Below elbow Releases air from cuff Listens for noise (clicks) (systolic) Reduces pressure further Listens for sound becoming very faint (diastolic)	(4) (AO1)	**4**

Total Mark: 13

Question 4

(a)	Suggested answers: Advantage: Quicker Implants have to remain for several weeks at least Will find out sooner whether all the cancer cells have gone (Accept reduced danger to others) Advantage: Less dangerous radiation used X-rays known to damage cells Less change of surrounding healthy cells being badly damaged (Accept answers related to implant storage)	 (1) (AO2) (1) (AO2) (1) (AO2) (1) (AO2) (1) (AO2) (1) (AO2)	**6**
(b)	Any sensible answer: E.g. more surgeons know the technique Don't know long term effects of microwaves	(1) (AO2)	**1**

(c)	Any sensible advantage Explained E.g. Less scarring Because of smaller incision Any sensible disadvantage Explained E.g. Harder to see what you are doing Because of smaller incision/ not viewing directly	(1) (AO1) (1) (AO2) (1) (AO1) (1) (AO2)	**4**
(d)(i)	Fibre optic device / device used to view inside the body	(1) (AO1)	**1**
(ii)	Any four relevant points: E.g: Light travels down fibres Made of glass With high refractive index Reflects along fibre/ light from area viewed reflects back up fibre Using total internal reflection	(4) (AO1)	**4**
(e)	One incision for the surgeon's tools, the other for the endoscope	(1) (AO2)	**1**

Total Mark: 17

Question 5

(a)(i)	Velocity = frequency x wavelength	(1) (AO1)	**1**
(ii)	0.000165m (one compensation mark for EITHER correct re-arrangement OR correct substitution OR 165 with wrong power of 10)	(2) (AO2)	**2**
(b)	0.427 – award ONLY if no evidence of incorrect method Allow 1 compensation mark for: Correct equation Correct substitution Correct squaring MAX 2	(3) (AO2)	**3**
(c)(i)	To stop reflection (from the skin)	(1) (AO1)	**1**
(ii)	About the same size	(1) (AO1)	**1**
(d)	Safer Better contrast	(1) (AO1) (1) (AO1)	**2**

Total Mark: 10

Question 6

(a)	Any 8 points (max 2 safety related) : Suitable source chosen Suitable detector chosen Suitable screens chosen (for beta emitter) Source held safely (e.g. tongs) Source not directed at anyone Source replaced when not in use Screens altered Screen needed to stop radiation noted Fair test described Experiment repeated Appropriate reference to background radiation (Answers related to measuring maximum penetration through air accepted).	(8) (AO3)	**8**
(b)	Lower penetration/very ionising Reason why good as implant – acts at site Reason why not good as tracer – would not be detected outside the body	(1) (AO1) (1) (AO2) (1) (AO2)	**3**
(c)	Two weeks or more Any **two** of: Needs time to act on tumour Do not want to replace too often Activity needs to remain fairly constant	(1) (AO1) (2) (AO2)	**3**
(d)(i)	0.25(g) Allow one mark compensation for correct iterative Method OR realising that there have been 4 half lives	(2) (AO2)	**2**
(ii)	Long enough to complete the trace Patient does not remain radioactive for too long	(1) (AO2) (1) (AO2)	**2**
(iii)	Any **two** of: Can be manufactured on site/quickly/easily Cheap (relatively) Emits ONLY beta radiation Energy range suitable for use with gamma camera Can be incorporated into many pharmaceuticals Can be manufactured as and when needed. No particular organ affinity	(2) (AO2)	**2**

Total Mark: 20