Eduqas Physics GCSE
Topic 6.2: Interactions of electromagnetic radiation with matter and their applications
Mark Schemes for Questions by topic

1.

Question				Marking details	Marks
2.		(i)		Infra-red (1) Micro[waves] (1) Micro[waves] (1)	3
		(ii)		Radio [waves]	1
				Question total	**[4]**

2.

(a) any **two** from:

- travel (at same speed) through a vacuum / space
  *do **not** accept air for vacuum*
- transverse
- transfer energy
- can be reflected
- can be refracted
- can be diffracted
- can be absorbed
- travel in straight lines

2

(b) can pass through the ionosphere

accept atmosphere for ionosphere
*do **not** accept air for ionosphere*
accept travel in straight lines
accept not refracted / reflected / absorbed by the ionosphere

1

(c) $v = f \lambda$

1.2×10^6 / 1200 000

*allow **1** mark for correct substitution*
ie $3.0 \times 10^8 = f \times 2.5 \times 10^2$

2

hertz / Hz

*do **not** accept hz **or** HZ*

*accept kHz **or** MHz*

*answers 1.2 MHz **or** 1200 kHz gain all **3** marks*

for full credit the unit and numerical value must be consistent

1

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3.

(c) (i) (skin) burns

1

(ii) skin cancer / blindness

1

(d) (i) any **one** from:

- (detecting) bone fractures
- (detecting) dental problems
- treating cancer

1

(ii) any **one** from:

- affect photographic film
- absorbed by bone
- transmitted by soft tissue
- kill (cancer) cells

*answer must link to answer given in **(d)(i)***

1

(iii) 9 / 36 = 0.25
0.5 / 2 = 0.25
4 / 16 = 0.25

accept:

36 / 9 = 4

2 / 0.5 = 4

16 / 4 = 4

2

conclusion based on calculation

*two calculations correct with a valid conclusion scores **2** marks*

*one correct calculation of k scores **1** mark*

1

4.

(a) C or 0.18 mm

1

(b) 0.6 (m)

*allow **1** mark for correct substitution and/or transformation **or** **1** mark for changing frequency to Hz*
*answer 600 gains **1** mark*

2

(c) creates an alternating current

accept 'ac' for alternating currentaccept alternating voltage

1

with the same frequency as the radio wave

accept signal for radio wave

*accept it gets hotter for **1** mark provided no other marks scored*

1

(d) X-rays cannot penetrate the atmosphere

accept atmosphere stops X-rays

*do **not** accept atmosphere in the way*

or

X-rays are absorbed (by the atmosphere) before reaching Earth

ignore explanations

1

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5.

Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
(a)	(i)		2	Refraction (1) The waves change speed **OR** change in density (1)	Glass is more dense Waves move more slowly	Reference to direction changing	Internal refraction Waves move more quickly Glass is less dense
	(ii)	I	1	Reflected at same angle (by eye)	Angle labelled as 55°	Ignore any effect on the ray after B	
		II	2	Directed from a more dense to a less dense medium (1) [at an angle] greater than critical angle [for glass] / greater than 42° (1) **no ecf** **The 2nd mark must be linked to the 1st mark.**		Reference to TIR	
(b)	(i)		1	1.3 [cm]	13 mm if cm is deleted		
	(ii)		2	**At least 3 wavefronts:** All drawn wavefronts beyond the boundary bending downwards (1) All drawn wavefronts parallel to each other **and** with a smaller wavelength (1) **2nd mark can't be awarded unless the 1st mark has been awarded.**		Wave direction without wavefronts	Extra wavefronts drawn in between – 0 marks