

Question	Answer	Marks	AO Element	Notes	Guidance
1	wavelength	1			
	frequency	1			
2	visible light gamma rays	2			
3(a)	light travels faster than sound or converse argument	1			
3(b)(i)	<u>echo</u>	1			
3(b)(ii)	amplitude - smaller speed - the same	2			
3(c)	speed = distance ÷ time 170 + 170 OR 340 ÷ 1 340 (m/s)	3			
4	any two from: - microwave not heard / sound is heard - sound is slower / longitudinal wave or signal is transverse - sound needs medium / cannot travel through a vacuum - signal is electromagnetic wave - sound has longer wavelength / lower frequency	B2			owtte

Question	Answer	Marks	AO Element	Notes	Guidance
5	infra-red next to visible	B1			
	microwaves next to radio waves	B1			
6	medical imaging OR security scanning (at airports etc.) OR dentistry OR finding defects in welding	B1			
7	transverse waves OR travel at same (high) speed OR travel across a vacuum	B1			
8	use of shielding OR monitor exposure	B1			
9	gamma rays	B1			
10(a)	X-rays	B1			IGNORE answers in boxes

Question	Answer	Marks	AO Element	Notes	Guidance
10(b)	any two from: • sensor detects warm things/heat/ <u>changes</u> in temperature • person is warmer/at different temperature (than surroundings) • person emits (more) IR (than surroundings)	B2		max [2]	
11	smaller	B1			
12	C - Infra-red waves have lower frequencies.	1			
13	A - infra-red waves, microwaves and radio waves	1			
14	A	1			
15	A - infra-red	1			
[Total: 27]					