1)

(a)	**(i)1**	amplitude = 0.4(0) mm	A1	
	(i)2	wavelength = 7.5×10^{-2} m (1 sig. fig. -1 unless already penalised)	A1	
	(i)3	period = 0.225 ms frequency = $1/T$ = 4400 Hz	C1 A1	
	(i)4	$v = f\lambda$ $= 4400 \times 7.5 \times 10^{-2}$ = 330 m s^{-1}	 C1 A1	[6]
(a)	**(ii)**	reasonable shape, same amplitude and wavelength doubled	B1	[1]

2)

(a)	**(i)**	frequency:	number of oscillations per unit time of the source / of a point on the wave	M1 A1	[2]
	(ii)	speed:	speed at which energy is transferred / speed of wavefront	B1	[1]

3)

(a)	**(i)**	λ = 0.6 m	B1	
	(ii)	frequency (= v/λ) = 330/0.60 = 550 Hz *(use of $c = 3 \times 10^8$ ms^{-1} scores no marks)*	C1 A1	**[3]**
(b)		amplitude shown as greater than *a* but less than 2*a* and constant correct phase *(wave to be at least three half-periods, otherwise -1 overall)*	B1 B1	**[2]**
		Total		**[5]**

4)

(a)	all same speed in a vacuum (allow medium)/all travel in a vacuum	(1)	
	transverse/can be polarised	(1)	
	undergo diffraction/interference/superposition	(1)	
	can be reflected/refracted	(1)	
	show properties of particles	(1)	
	oscillating electric and magnetic fields	(1)	
	transfer energy/progressive	(1)	
	not affected by electric and magnetic fields	(1)	
	(allow any three, 1 each)		**B3 [3]**
(b)	495 nm = 495×10^{-9} m		**C1**
	number = $1/(495 \times 10^{-9}) = 2.02 \times 10^{6}$		**A1 [2]**
	(allow 2 or more significant figures)		
(c)	**(i)** allow $10^{-7} \rightarrow 10^{-11}$ m		**B1**
	(ii) allow $10^{-3} \rightarrow 10^{-6}$ m		**B1 [2]**

5)

(a)	wavelength = 1.50 m	**B1 [1]**
(b)	$v = f\lambda$	**C1**
	speed = 540 m s^{-1}	**A1 [2]**

6)

(a)		similarity: e.g. same wavelength/frequency/period, constant phase difference	B1	
		difference: e.g. different amplitude/phase (do not allow a reference to phase for both similarity and difference)	B1	**[2]**
(b)		constant phase difference so coherent	B1	**[1]**
(c)	**(i)**	*intensity* $\propto$ *amplitude*^{2}	C1	
		$I \propto 3^2$ and $I_B \propto 2^2$ leading to	M1	
		$I_B = \frac{4}{9}I$	A0	**[2]**
	(ii)	resultant amplitude = 1.0×10^{-4} cm	C1	
		resultant intensity = $\frac{1}{9}I$	A1	**[2]**
(d)	**(i)**	displacement = 0	B1	**[1]**
	(ii)	$x_A = -2.6 \times 10^{-4}$ cm and $x_B = +1.7 \times 10^{-4}$ cm allow $\pm$ 0.5×10^{-4} cm)	C1	
		resultant displacement = (-) 0.9×10^{-4} cm	A1	**[2]**

7)

(a)	**(i)**	vibration<u>s</u> (in plane) <u>normal</u> to direction of energy propagation	B1	[1]
	(ii)	vibrations in <u>one</u> direction (normal to direction of propagation)	B1	[1]
(b)	**(i)**	at (displacement) antinodes / where there are no heaps, wave has maximum amplitude (of vibration)	B1	
		at (displacement) nodes/where there are heaps, amplitude of vibration is zero/minimum	B1	
		dust is pushed to / settles at (displacement) nodes	B1	[3]
	(ii)	$2.5\lambda = 39$ cm	C1	
		$v = f\lambda$	C1	
		$v = 2.14 \times 10^3 \times 15.6 \times 10^{-2}$		
		$= 334$ m s^{-1} (*allow 330, not 340*)	A1	[3]
(c)		Stationary wave formed by interference / superposition / overlap of	B1	
		either wave travelling down tube and its reflection		
		or two waves of same (type and) frequency travelling in opposite directions	B1	
		speed is the speed of the incident / reflected waves	B1	[3]