Waves - Mark Scheme

Q1.

Question Number	Answer	Mark
	B is the correct answer A is not the correct answer as X and Z are in antiphase C is not the correct answer as Y and Z have the same frequency D is not the correct answer as point Z is an antinode	**(1)**

Q2.

Question Number	Answer	Mark
	A is the correct answer B is not the correct answer as it can be altered to change frequency (CP 5) C is not the correct answer as it can be altered to change frequency (CP 5) D is not the correct answer as it can be altered to change frequency (CP 5)	**(1)**

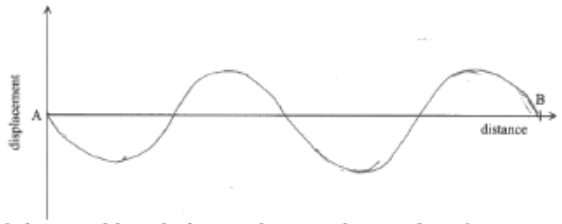
Q3.

Question Number	Answer	Mark
	B is the correct answer as $7\lambda/4$ represents 3.5 radians, which is 1.5π radians out of phase. A is not the correct answer as $3\lambda/2$ represents 3π radians which is antiphase C is not the correct answer as 3λ represents 6π radians which is in phase D is not the correct answer as $7\lambda/2$ represents 7π radians, which is antiphase	**(1)**

Q4.

Question Number	Answer	Mark
	B is the correct answer (A path difference of λ would cause constructive interference A is not the correct answer as this path difference would cause destructive interference C is not the correct answer as this phase difference would cause neither constructive nor destructive interference D is not the correct answer as this phase difference would cause destructive interference	**(1)**

Q5.

Question Number	Answer		Mark
ai	Minimum labelled at either rarefaction	(1)	**(1)**
aii	Zero displacement at all compressions and/or all rarefactions. Two complete wave cycles shown.  (Allow graph inverted in relation to the one shown above)	(1) (1)	**(2)**
bi	Describes an initial situation where the two traces are in antiphase / phase Record the position of the microphone (from the metre rule) **Or** Measure the distance from the loudspeaker to the microphone Move microphone (gradually) until the two traces are next in antiphase / phase Record the new position of the microphone and calculate the distance moved by the microphone **Or** Measure the new distance from the loudspeaker to the microphone and calculate the distance moved by the microphone Multiply calculated/measured wavelength by frequency to determine the speed **Or** Describes a suitable graph to determine the speed (MP5 - examples of suitable graphs are λ against $1/f$ or f against $1/\lambda$. Both would give a gradient of v which needs to be stated to achieve the mark)	(1) (1) (1) (1) (1)	**(5)**
bii	Time period read off oscilloscope (from one point to the next in phase point) **Or** number of waves per second read off oscilloscope Time period (for both traces) is the same	(1) (1)	**(2)**
biii	Use of $v = f\lambda$ Calculates λ of 8.5 cm (for 4.0 kHz) **and** 2.3 cm (for 15.0 kHz) Percentage uncertainty greater for 2.3cm than 8.5cm (so student correct) **Or** Percentage uncertainty greater for 15.0kHz than 4.0kHz (so student correct) **Or** Percentage uncertainty is reduced if measurements taken across several wavelengths (so student not necessarily correct) (Do not allow "uncertainty" for "percentage uncertainty") **Example of calculation** $\lambda = v/f = (340\ ms^{-1}) / (4000\ Hz) = 0.085\ m$ $\lambda = v/f = (340\ ms^{-1}) / (15000\ Hz) = 0.023\ m$	(1) (1) (1)	**(3)**
	Total for question		**13**

Q6.

Question Number	Answer	Mark
	D is the correct answer A is not the correct answer as waves on a string are transverse B is not the correct answer as waves on a string are transverse C is not the correct answer as waves on a vibrating string are not progressive	**(1)**