

Mark Scheme

Q1.

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)

Q2.

Question Number	Answer	Mark
	The only correct answer is D $\left(f \propto \frac{1}{\lambda}\right)$ A is not correct because $f \propto \frac{1}{\lambda}$ B is not correct because $f \propto \frac{1}{\lambda}$ C is not correct because $f \propto \frac{1}{\lambda}$	1

Q3.

Question Number	Answer	Mark
	D is the correct answer as rarefactions are points where the pressure is a minimum. A is not the correct answer as there is no displacement of the particles at a compression. B is not the correct answer as the pressure is a maximum at a compression. C is not the correct answer as there is no displacement of the particles at a rarefaction.	(1)

Q4.

Question Number	Answer	Mark
	B is the correct answer as decreasing the time period increases the frequency ($f = 1/T$) A is not the correct answer as amplitude is unaffected by time period C is not the correct answer as speed is affected by both time period and wavelength D is not the correct answer as wavelength is affected by both time period and speed	(1)

Q5.

Question Number	Answer	Mark
	A is the correct answer as frequency is unchanged when travelling into a different medium B is not the correct answer as some of the light intensity becomes the reflected light. C is not the correct answer as the speed decreases when travelling into a more optically-dense substance D is not the correct answer as the wavelength decreases when travelling into a more optically-dense substance	(1)

Q6.

Question Number	Answer	Mark
	B is the correct answer as the time period is 0.4 seconds, and $f = 1/T$ A is not the correct answer as the amplitude is 10cm. C is not the correct answer as the time period is 0.4 seconds D is not the correct answer as the wavelength cannot be determined from a graph of displacement against time.	(1)

Q7.

Question Number	Answer	Mark
	C is the correct answer (Both transverse and longitudinal waves can be refracted) A is not the correct answer as it is only electromagnetic waves that travel at the same speed in a vacuum – there are other transverse waves which travel at different speeds B is not the correct answer as transverse waves have vibrations that are perpendicular to the direction of wave travel D is not the correct answer as light is a transverse wave that can travel through liquids	(1)

Q8.

Question Number	Answer	Mark
	The only correct answer is D (pressure is minimum displacement is zero) A is not correct because displacement at a compression is zero and pressure at a rarefaction is minimum B is not correct because displacement at a compression is zero and pressure at a rarefaction is minimum C is not correct because displacement at a compression is zero and pressure at a rarefaction is minimum	1

Q9.

Question Number	Answer	Mark
	A is the correct answer B is not the correct answer as both compressions and rarefactions have zero displacement of molecules at their centre. C is not the correct answer as both compressions and rarefactions have zero displacement of molecules at their centre. D is not the correct answer as both compressions and rarefactions have zero displacement of molecules at their centre.	(1)

Q10.

Question Number	Answer	Mark
	B is the correct answer A is not the correct answer as the amplitude decreases C is not the correct answer as the speed decreases D is not the correct answer as the wavelength decreases	(1)

Q11.

Question Number	Answer	Mark
	C is the correct answer A is not correct because this would describe the motion if it was a stationary wave. B is not correct because in a complete time period F and G would then reverse direction again. D is not correct because the wave is travelling to the right, not to the left.	1

Q12.

Question Number	Answer	Mark
	D is the correct answer A is not the correct answer as the speed of a wave is independent of its amplitude. B is not the correct answer as the speed of a wave is independent of its amplitude. C is not the correct answer as period and frequency are both related to time. To calculate speed, a quantity involving distance is also required.	(1)

Q13.

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)

Q14.

Question Number	Answer	Mark
	The only correct answer is A (2 m) B is not correct because this would be 1.5 wavelengths C is not correct because this would be 2 wavelengths D is not correct because this would be 3 wavelengths	1

Q15.

Question Number	Answer	Mark
	C is the correct answer as to calculate speed, the wavelength is determined from the displacement-distance graph and multiplied by the frequency which is determined from the displacement-time graph. A is not the correct answer as this can be determined from either graph B is not the correct answer as this can be determined from the displacement-time graph only D is not the correct answer as this can be determined from the displacement-distance graph only	(1)

Q16.

Question Number	Answer	Mark
a	Use of $v = f\lambda$ (1) $\lambda = 0.40$ (m) (1) Wave is suitable (1) OR Use of $v = f\lambda$ (1) $f = 850$ (Hz) / 0.85 (kHz) (1) Wave is suitable (1) OR Use of $v = f\lambda$ (1) $v = 340$ (m/s) (1) Wave is suitable (1) (MP3 by any method is dependent upon awarding both MP1 and MP2) <u>Example of calculation</u> $v = f\lambda$ $340 \text{ m s}^{-1} = 850 \text{ Hz} \times \lambda$ $\lambda = 0.40 \text{ m}$	3

* **b**

This question assesses a student's ability to show a coherent and logically structured answer with linkages and fully-sustained reasoning. Marks are awarded for indicative content and for how the answer is structured and shows lines of reasoning. The following table shows how the marks should be awarded for indicative content.

IC points	IC mark	Max linkage mark	Max final mark
6	4	2	6
5	3	2	5
4	3	1	4
3	2	1	3
2	2	0	2
1	1	0	1
0	0	0	0

The following table shows how the marks should be awarded for structure and lines of reasoning.

	Number of marks awarded for structure of answer and sustained line of reasoning
Answer shows a coherent and logical structure with linkages and fully sustained lines of reasoning demonstrated throughout	2
Answer is partially structured with some linkages and lines of reasoning	1
Answer has no linkages between points and is unstructured	0

	Indicative content • Sound (from ANR) has to diffract to reach the furthest/right ear • (Sound) cancelled when destructive interference takes place • (Sound) louder when constructive interference takes place • Destructive interference is where waves are in antiphase • Constructive interference is where waves are in phase • When distance between the ears is half a wavelength Or distance between the ears is approximately 20cm. (For IC1, do not allow “noise from engine diffracts to reach the right ear”) (For IC2 to IC5, interference or superposition are accepted) (For IC2 and IC3 accept correct reference to minimum/maximum amplitude) (For IC4 and IC5, accept answers in terms of path difference. However, path difference must be in terms of λ and phase difference in terms of π or $^\circ$) Linkage mark 1 – needs at least 2 from IC1-IC3 to consider this. Linkage mark 2 – needs at least 2 from IC4-IC6 to consider this.	6
	Total for question	9