

Mark Scheme

Combined Science GCSE

Waves Test

(Levels 4-9)

	Answer	Marks																		
1. (a)	Transverse waves are perpendicular to the direction of the wave. Longitudinal waves are parallel to the direction of energy transfer. They show rarefaction and compression.	(1) (1) (1)																		
1. (b)	1 mark for each correct answer <table border="1"> <thead> <tr> <th>Type of Wave</th><th>Longitudinal</th><th>Transverse</th></tr> </thead> <tbody> <tr> <td>Waves in water</td><td></td><td>✓</td></tr> <tr> <td>Sound waves</td><td>✓</td><td></td></tr> <tr> <td>Electromagnetic waves</td><td></td><td>✓</td></tr> <tr> <td>P-waves</td><td>✓</td><td></td></tr> <tr> <td>S-waves</td><td></td><td>✓</td></tr> </tbody> </table>	Type of Wave	Longitudinal	Transverse	Waves in water		✓	Sound waves	✓		Electromagnetic waves		✓	P-waves	✓		S-waves		✓	(4)
Type of Wave	Longitudinal	Transverse																		
Waves in water		✓																		
Sound waves	✓																			
Electromagnetic waves		✓																		
P-waves	✓																			
S-waves		✓																		
1. (c)	Frequency is the number of waves per second. It is measured in hertz (Hz).	(1) (1)																		

(Total for Question 1 = 9 marks)

	Answer	Marks
2. (a)	1: wavelength 2: amplitude 3: crest 4: trough	(4)
2. (b)	wave speed (m/s) = distance (m) ÷ time (s) $v = \frac{x}{t}$ wave speed (m/s) = frequency (Hz) × wavelength (m) $v = f \times \lambda$	(2) (2)
2. (c)	$v = \frac{x}{t} = \frac{5000}{0.5} = 10\,000 \text{ Hz or } 10\text{KHz}$	(2)
2. (d)	$v = f \times \lambda$ rearrange $\frac{250}{50} = 5\text{Hz}$	(2)

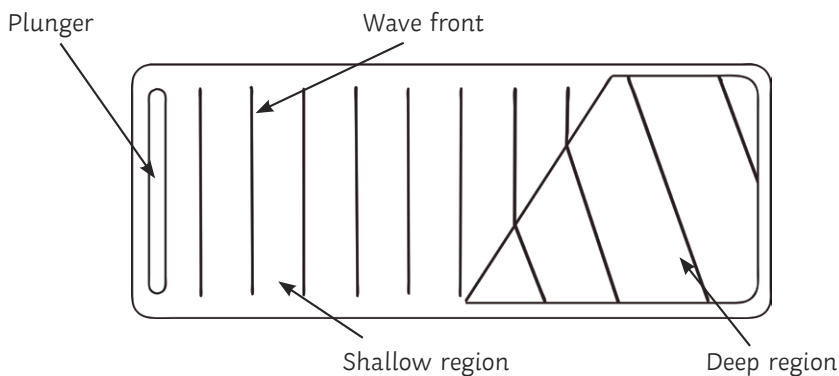
(Total for Question 2 = 12 marks)

	Answer	Marks								
3. (a)	Bar chart – one of the variables is categorical (name of metal).	(2)								
3. (b)	Enables anomalous results to be identified. Students can use the results to calculate a mean. Repetition leads to the data becoming more reliable.	(1) (1) (1)								
3. (c)	<table border="1"><thead><tr><th>0 marks</th><th>1-2 marks</th><th>3-4 marks</th><th>5-6 marks</th></tr></thead><tbody><tr><td>No relevant content</td><td>Includes a brief but workable method, and either at least one safety precaution or an equipment list.</td><td>Includes a workable method, including an equipment list and at least one safety precaution.</td><td>There is a detailed method including scientific terms and equations. Detailed equipment list and safety precaution included.</td></tr></tbody></table> Marking suggestions: Equipment: Signal generator, ripple tank with dipper, strobe light, ruler Method: Using a signal generator attached to the dipper of a ripple tank, water waves of a desired frequency can be produced. Turn on the strobe light and wave patterns will appear on the screen found below the tank. Alter the frequency of the strobe light until the frequency of the waves and the strobe are equal. Measure the distance between the lines, and calculate the average wave length. Calculate the speed of the waves using the equation $v = f \times \lambda$. Safety Precaution: Take care when using electrical equipment near electricity.	0 marks	1-2 marks	3-4 marks	5-6 marks	No relevant content	Includes a brief but workable method, and either at least one safety precaution or an equipment list.	Includes a workable method, including an equipment list and at least one safety precaution.	There is a detailed method including scientific terms and equations. Detailed equipment list and safety precaution included.	(6)
0 marks	1-2 marks	3-4 marks	5-6 marks							
No relevant content	Includes a brief but workable method, and either at least one safety precaution or an equipment list.	Includes a workable method, including an equipment list and at least one safety precaution.	There is a detailed method including scientific terms and equations. Detailed equipment list and safety precaution included.							

(Total for Question 3 = 11 marks)

	Answer	Marks
4. (a)	Wave is absorbed. Wave is transmitted. Wave is reflected.	(3)
4. (b)	Refracted – there is a change of direction of the wave.	(1)
4. (c)	4×0.024 0.096 m/s	(1) (1) (1)

(Total for Question 4 = 7 marks)

	Answer	Marks
5. (a)		(1)
5. (b)	The waves move further apart and increase in speed.	(1) (1)

(Total for Question 5 = 3 marks)

	Answer	Marks
6. (a)	Longitudinal	(1)
6. (b)	(i) 2 and 3	(1)
	(ii) 1 and 2	(1)
6. (c)	The period of a wave is the amount of time (seconds) it takes to complete one full cycle.	(1)
6. (d)	Convert cm to m	(1)
	$7.8 \div 100 = 0.078\text{m}$	(1)
	Rearrange equation $v = f \times \lambda = \text{speed} \div \text{wavelength}$	(2)
	$\frac{0.35}{0.078} = 4.49 \text{ Hz}$ (correct answer to 2 decimal points 1 mark and correct unit 1 mark)	

(Total for Question 6 = 8 marks)

TOTAL FOR PAPER = 50 MARKS