Measuring waves

Physics required practical | AQA Combined Science 8464 and AQA GCSE Physics 8463 | 14 questions, 36 marks

GCSE science required practicals

This practical online

Name: _____ **Date:** _____ **Score:** _____ **/ 36**

Aim: To measure the frequency, wavelength and speed of waves in a ripple tank and of waves on a stretched string, and to decide which equipment suits each.

Equipment: Ripple tank with a motor-driven wooden bar (dipper) and lamp above; Sheet of white paper or card under the tank; Metre ruler; Stopwatch; Signal generator and vibration generator; Elastic string or thin cord; Pulley clamped to the end of the bench; Mass hanger and 100 g slotted masses; Wooden bridge to support the string; Camera or phone to photograph the wave pattern.

Results

Aisha set up a string with a vibration generator. The vibrating length of string was 1.20 m and the hanging mass stayed the same. She changed the frequency to get different numbers of loops and worked out the wavelength and wave speed each time.

Frequency in Hz	Number of loops	Wavelength in m	Wave speed in m/s
10.1	1	2.40	24.2
19.8	2	1.20	23.8
30.4	3	0.80	24.3
35.2	4	0.60	21.1
50.2	5	0.48	24.1
59.6	6	0.40	23.8

Questions

1 Look at Aisha's experiment with the string.

a. Name the independent variable.

b. Name the dependent variable.

c. Give one control variable.

(3 marks)

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2 In the ripple tank, Daniel measured the distance across ten waves and divided by ten, instead of measuring one wave. Explain why. (2 marks)

3 The ripples move too quickly for Daniel to measure them easily with a ruler. Suggest an improvement and explain why it helps. (2 marks)

4 Give one hazard when using the ripple tank and explain how to reduce the risk. (2 marks)

5 Daniel measured 21.0 cm across ten waves. Calculate the wavelength in cm. (2 marks)

6 Daniel counted 40 waves passing a mark on the paper in 5.0 s. Calculate the frequency of the waves. (2 marks)

7 The ripples have a frequency of 8.0 Hz and a wavelength of 2.1 cm. Calculate the speed of the ripples in m/s. Show your working. (3 marks)

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8 Calculate the period of the ripples, which have a frequency of 8.0 Hz.

period = 1 ÷ frequency

(2 marks)

9 The vibrating length of Aisha's string is 1.20 m. Show that the wavelength is 0.80 m when there are 3 loops.

(2 marks)

10 Identify the anomalous result in Aisha's table and say what she should do about it.

(2 marks)

11 Calculate the mean wave speed on the string, leaving out the anomalous result. Give your answer to 3 significant figures. Show your working.

(3 marks)

12 **Higher tier**

Daniel keeps the water depth the same, so the ripples still travel at 0.168 m/s. He turns up the motor so the frequency is 12 Hz. Calculate the new wavelength in cm. Show your working.

(3 marks)

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13 **Higher tier**

Aisha's frequency went up by about six times, but the wave speed hardly changed. Explain this using the results.

(2 marks)

14 Plan an investigation to find out how the depth of water in a ripple tank affects the speed of the ripples.

(6 marks)

End of questions | Total 36 marks | The answers sheet has the full method as revision notes.

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