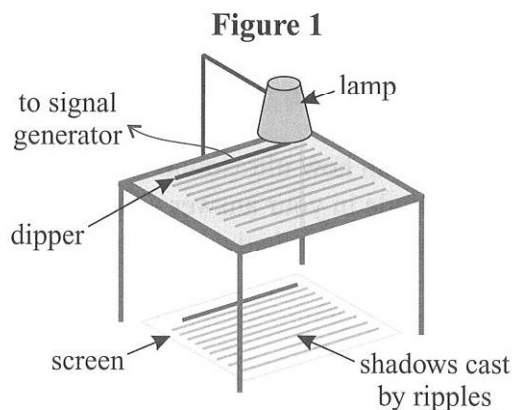


## Measuring Waves

1 A student sets up a ripple tank in a dark room.

She puts a screen beneath the tank, then sets up a lamp above the tank. She attaches a signal generator to the dipper in the tank. When she turns the signal generator on, ripples are generated and their shadows can be seen on the screen below. The shadow lines are the same size as the waves.



Her experimental set-up is shown in **Figure 1**. The waves have a frequency of 4.0 Hz and a period of 0.25 s.

a) The student finds that the total distance between the first and last of ten shadow lines is 27 cm. Calculate the time taken for one wave to move a distance of 18 cm across the tank.

Time taken = ..... s  
[5]

b) Another student suggests moving the lamp to the side of the tank so that it shines down on it at an angle. Suggest why they should **not** do this.

.....  
 .....  
 [1]

c) The student replaces the lamp with a stroboscope but keeps the rest of the set-up the same. A stroboscope flashes a bright light at regular time intervals. The student adjusts the time interval of the flashes until the ripples appear to stop moving. Give the shortest possible time interval that could be used by the student to achieve this effect. Explain your answer.

.....  
 .....  
 .....  
 [2]

[Total 8 marks]

**Exam Practice Tip**

Whenever you do a practical, think about why you're doing things a certain way and if you could do it better. You might be asked to suggest method improvements in the exams — if you're already in the habit of thinking about them, it should help you come up with them quickly and easily.

Score:   
8



# Exploring Structures Using Waves

- 1 Fake gold bars can be made by covering a bar of tungsten with a thin layer of gold. It is impossible to distinguish their weight from that of a real gold bar.

Explain how ultrasound can be used to test whether a gold bar is genuine or fake. Include in your answer what results you would expect if the bar was solid gold and if the bar had a tungsten core.

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*[Total 4 marks]*

- 2 Ultrasound can be used by ships to find the depth of the sea beneath them.

The maximum depth of the English Channel is 175 m. A ship located above the deepest part of the English Channel uses an ultrasound machine to direct a pulse of ultrasound to the sea floor. An echo is received at the ship 0.23 seconds after the initial pulse was sent.

A different point in the English Channel has a depth of 63 m. Calculate how long it would take for a pulse of ultrasound to travel from the surface of this point of the English Channel to the sea floor and back again. Give your answer to two significant figures.

Time taken = ..... s  
*[Total 5 marks]*

