

- c) If a note of the third-lowest possible frequency were played, state the positions of the nodes.
- D5.7 Two microwave emitters are placed facing each other about a metre apart and coherently emit microwaves of the same frequency. A detector moved back and forth between them detects regions of maximum intensity spaced 4.0 cm apart. Calculate the frequency of the microwaves.
- D5.8 A musical note of several frequencies is sounded at the mouth of a 1.0 m long vertical tube that has some water in the bottom.
- Give the depth of water in the tube if the fundamental frequency heard is 125 Hz.
 - When the lowest frequency above the fundamental is played, at what height will the particles' displacement be out of phase and have the same amplitude as particles 8.0 cm above the surface of the water? Give your answer as a distance above the surface of the water.

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D6 The Photoelectric Effect

When the photon energy is insufficient for the ejection of photoelectrons, answer the question by writing 'no electrons emitted'.

- D6.1 Complete the questions in the table:

Frequency of light /Hz	Wavelength of light /nm	Work function	Max. KE of photoelectrons	Stopping potential /V
6.0×10^{14}		1.2×10^{-19} J	(a)	
6.0×10^{14}		2.6 eV		(b)
	350	2.6 eV		(c)
	530	(d)		1.35

- D6.2 A material's work function is 1.3 eV. Calculate its threshold frequency.
- D6.3 A material will not emit photoelectrons unless it is irradiated by light with a wavelength less than 380 nm. Calculate its work function in electronvolts.

- D6.4 a) Calculate the maximum speed of the photoelectrons emitted when a material with an 8.4×10^{-20} J work function is illuminated by light of frequency 7.0×10^{14} Hz.
- b) What is the minimum speed of the photoelectrons emitted?
- D6.5 A graph of stopping potential (y) against frequency of light (x) is plotted for zinc, and also for aluminium. Without knowing more information, answer the following questions:
- Are the lines straight or not?
 - Are the y -intercepts positive, negative or zero?
 - Are the gradients positive, negative or zero?
 - Are the gradients of the two lines the same or different?
 - Are the y -intercepts of the two lines the same or different?
 - What is the significance of the x -intercept?
 - If you answered 'same' to parts (d) or (e), write down the value of the common gradient or intercept.
- D6.6 A material has a work function of 3.4 eV, and is illuminated by 5.0 eV photons. Calculate the stopping potential of its photoelectrons.