AQA Examination-style questions

1 A student adjusted the tension of a stretched metal wire of length 820 mm so that when it vibrated, it emitted sound at the same frequency as a 256 Hz tuning fork.

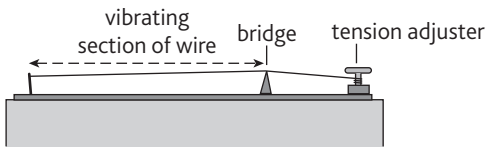

Figure 1

She then altered the length L of the vibrating section of the wire as shown in **Figure 1**, until it emitted sound at the same frequency as a 512 Hz tuning fork. She repeated the test several times to obtain the following measurements for the length L:

425 mm, 407 mm, 396 mm, 415 mm, 402 mm

(a) (i) Calculate the mean length L at 512 Hz.

(ii) Estimate the uncertainty in this length measurement. *(2 marks)*

(b) The student thought the measurements showed that the frequency of sound f emitted by the wire is inversely proportional to the length L of the vibrating section.

(i) Discuss whether or not the measurements support this hypothesis.

(ii) In order to test the hypothesis further, state what further measurements the student could make and show how these measurements should be used. Assume further calibrated tuning forks are available. *(9 marks)*

2 An ultrasonic signal from a ship travels vertically downwards through the water. The wavelength of the waves is 5.3×10^{-2} m and the frequency of the waves is 29 kHz.

(a) Calculate the speed of the sound through the water. *(3 marks)*

(b) The sound is reflected from the sea bed and is received back at the ship 0.23 s after it is transmitted. Calculate the depth of the water. *(2 marks)*

AQA, 2007

3 (a) State the characteristic features of

(i) longitudinal waves,

(ii) transverse waves. *(3 marks)*

(b) Daylight passes horizontally through a fixed polarising filter **P**. An observer views the light emerging through a second polarising filter **Q**, which may be rotated in a vertical plane about point **X** as shown in **Figure 2**.

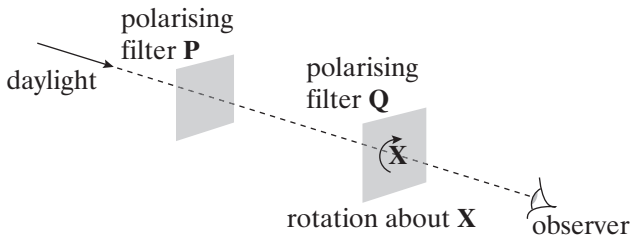

Figure 2

Describe what the observer would see as **Q** is rotated slowly through 360°. *(2 marks)*

AQA, 2005

4 Polarisation is a property of one type of wave.

(a) There are two general classes of wave, longitudinal and transverse. Which class of wave can be polarised? *(1 mark)*

(b) Give **one** example of the type of wave that can be polarised. *(1 mark)*

(c) Explain why some waves can be polarised but others cannot. *(3 marks)*

AQA, 2002

5 **Figure 3** shows three particles in a medium that is transmitting a sound wave. Particles **A** and **C** are separated by one wavelength and particle **B** is half way between them when no sound is being transmitted.

(a) Name the type of wave that is involved in the transmission of this sound. *(1 mark)*

(b) At one instant particle **A** is displaced to the point **A′** indicated by the tip of the arrow in **Figure 3**. Show on **Figure 3** the displacements of particles **B** and **C** at the same instant. Label the position **B′** and **C′**, respectively. *(2 marks)*

(c) Explain briefly how energy is transmitted in this sound wave. *(2 marks)*

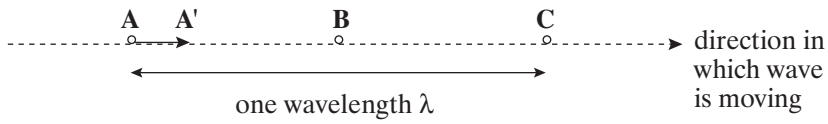

Figure 3

AQA, 2005

6 **Figure 4** represents a stationary wave on a stretched string. The continuous line shows the position of the string at a particular instant when the displacement is a maximum. P and S are the fixed ends of the string. Q and R are the positions of the nodes. The speed of waves on the string is 200 m s^{-1}.

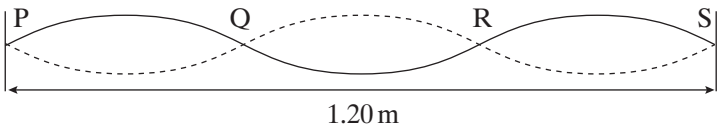

Figure 4

(i) State the wavelength of the waves on the string.

(ii) Calculate the frequency of vibration.

(iii) Draw on a copy of the diagram the position of the string 3.0 ms later than the position shown. Explain how you arrive at your answer. *(5 marks)*

AQA, 2004

7 Short pulses of sound are reflected from the wall of a building 18 m away from the sound source. The reflected pulses return to the source after 0.11 s.

(a) Calculate the speed of sound. *(3 marks)*

(b) The sound source now emits a continuous tone at a constant frequency. An observer, walking at a constant speed from the source to the wall, hears a regular rise and fall in the intensity of the sound. Explain how the **minima** of intensity occur. *(3 marks)*

AQA,2002

8 A microwave transmitter directs waves towards a metal plate, as shown in **Figure 5**. When a microwave detector is moved along a line normal to the transmitter and the plate it passes through a sequence of equally spaced maxima and minima of intensity.

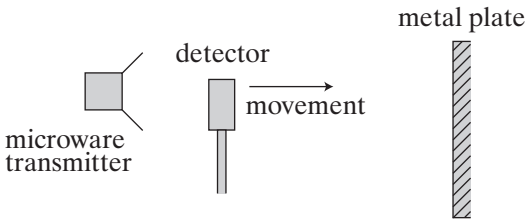

Figure 5

(a) Explain how these maxima and minima are formed. *(4 marks)*

(b) The detector is placed at a position where the intensity is a minimum. When it is moved a distance of 144 mm it passes through nine maxima and reaches the ninth minimum from the starting point. Calculate:

(i) the wavelength of the microwaves,

(ii) the frequency of the microwave transmitter. *(3 marks)*

AQA, 2003