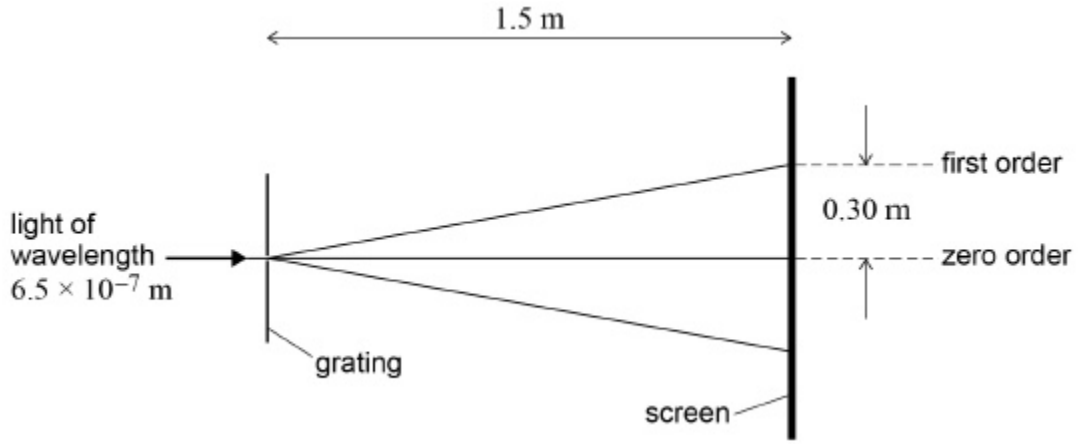
1 A diffraction grating is illuminated normally with light of wavelength 6.5×10^{-7} m
When a screen is 1.5 m from the grating, the distance between the zero and first-order maxima on the screen is 0.30 m



What is the number of lines per mm of the diffraction grating?

A 3.3×10^{-6} ⬭

B 3.3×10^{-3} ⬭

C 3.0×10^{2} ⬭

D 3.0×10^{5} ⬭

(Total 1 mark)

2 In a diffraction-grating experiment the maxima are produced on a screen.

What causes the separation of the maxima of the diffraction pattern to decrease?

A using light with a longer wavelength ⬭

B increasing the distance between the screen and grating ⬭

C increasing the distance between the source and grating ⬭

D using a grating with a greater slit separation ⬭

(Total 1 mark)

3 (a) Explain what is meant by a progressive wave.

_____

_____

_____

(2)

(b) **Figure 1** shows the variation with time of the displacement of one point in a progressive wave.

Figure 1

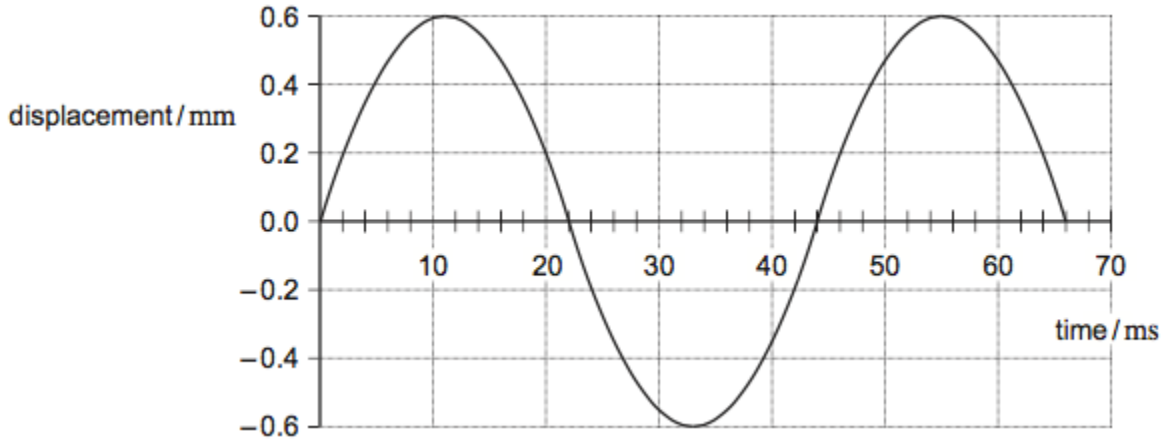
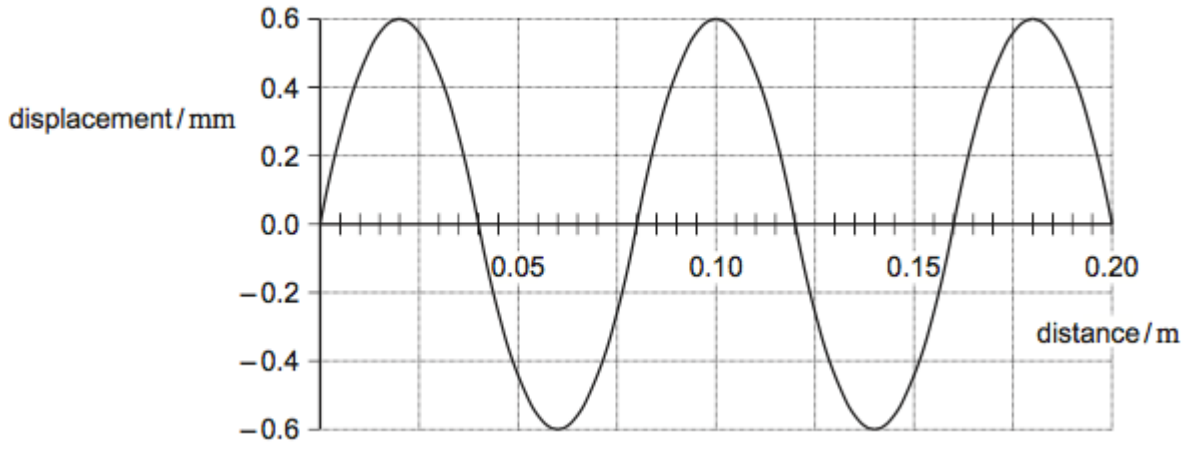


Figure 2 shows the variation of displacement of the same wave with distance.

Figure 2



Use **Figures 1 and 2** to determine

(i) the amplitude of the wave

amplitude = _____ mm

(1)

(ii) the wavelength of the wave

wavelength = _____ m

(1)

(iii) the frequency of the wave

frequency = _____ Hz

(1)

(iv) the speed of the wave

speed = _____ m s^{-1}

(1)

(c) Which of the following statements apply?
Place a tick (✓) in the right-hand column for each correct statement.

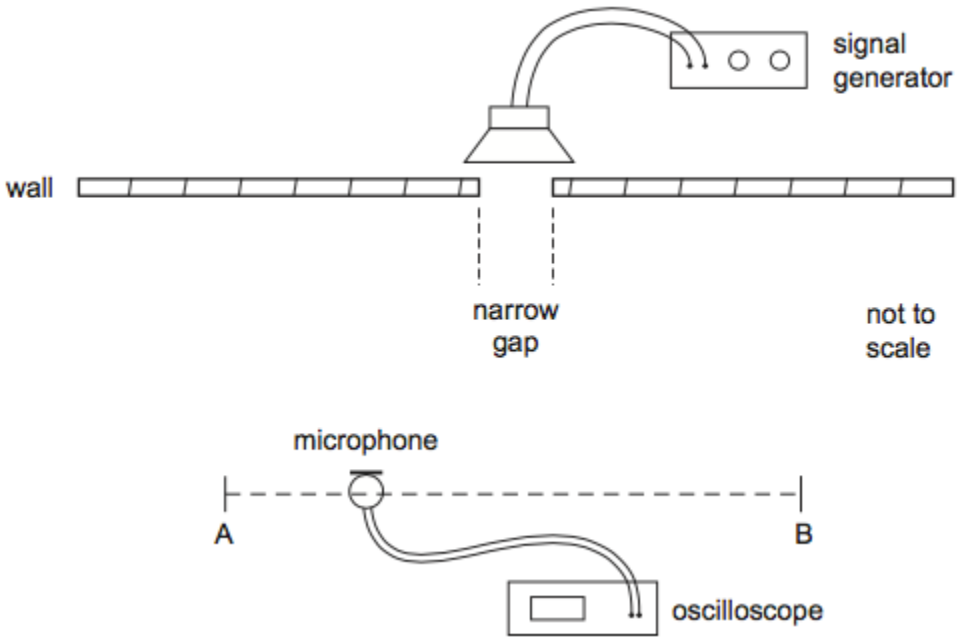
	✓ if correct
sound waves are transverse	
sound waves are longitudinal	
sound waves can interfere	
sound waves can be polarised	

(1)

(d) In an investigation, a single loudspeaker is positioned behind a wall with a narrow gap as shown in **Figure 3**.

A microphone attached to an oscilloscope enables changes in the amplitude of the sound to be determined for different positions of the microphone.

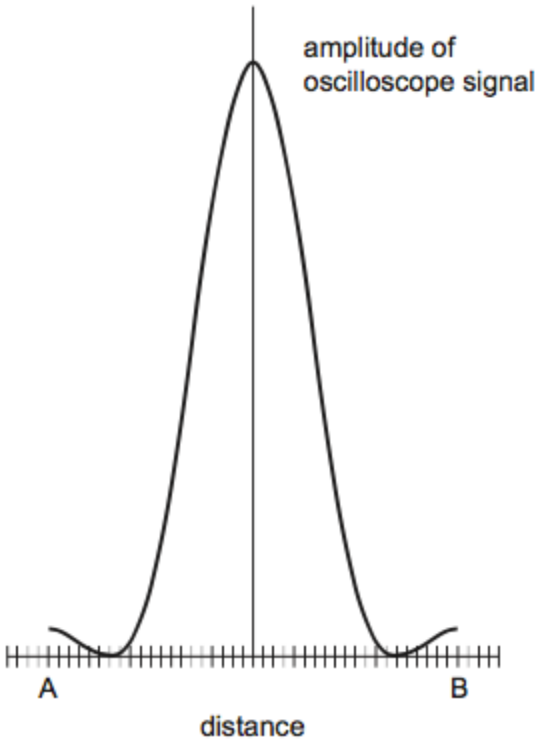
Figure 3



The amplitude of sound is recorded as the microphone position is moved along the line AB a large distance from the gap.

The result of the measurements is shown in **Figure 4**.

Figure 4



The signal generator is adjusted so that sound waves of the same amplitude but of a higher frequency are emitted by the loudspeaker. The investigation using the apparatus shown in **Figure 3** is then repeated.
Explain the effect this has on **Figure 4**.

(3)

(Total 10 marks)