28 A light wave passes through a single slit and a diffraction pattern forms.

What happens to the frequency and the speed of the wave when it is diffracted?

	frequency	speed
A	decreases	increases
B	increases	decreases
C	no change	decreases
D	no change	no change

26 For a progressive transverse wave, what describes the term diffraction?

A the change in observed frequency of a wave due to a movement of the wave source

B the spreading of a wave as it passes through a gap or around an obstacle

C when oscillations of a wave are confined to one plane

D the resultant displacement of two waves is equal to the sum of the displacements of the individual waves when the waves meet

4 **(a)** State what is meant by diffraction of a wave.

.....

.....

..... [2]

(b) A beam of vertically polarised light of wavelength 540 nm is incident normally on a diffraction grating, as shown in Fig. 4.1.

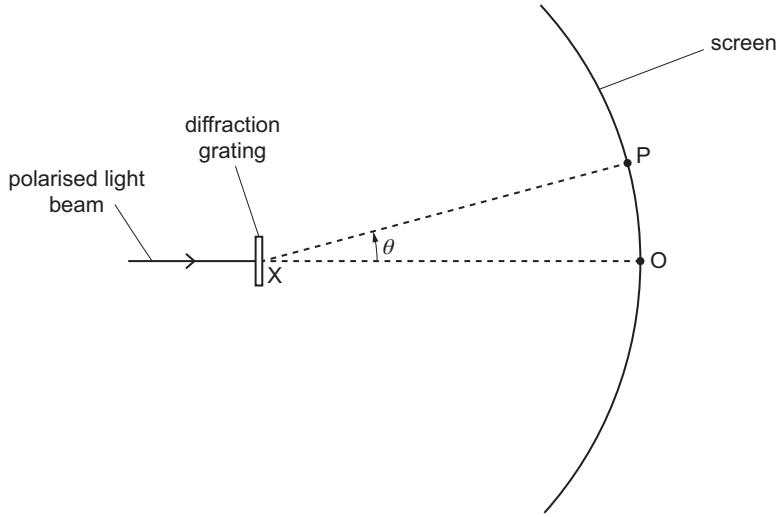


Fig. 4.1 (not to scale)

The diffraction grating has a line spacing of 5.0×10^{-6} m.

The light transmitted by the diffraction grating illuminates a circular screen. The diffraction grating is at the centre X of the circle.

The central bright fringe is formed at point O on the screen and has intensity I_0.

P is a point on the screen where the line XP is at a variable angle θ to the line XO. The intensity I of light on the screen at P varies with θ.

(i) Show that the angle θ at which the first-order bright fringe is formed is 6.2°.

[2]

(ii) Determine the value of θ at which the second-order bright fringe is formed.

θ = ...° [1]

(iii) On Fig. 4.2, sketch the variation of the intensity I with θ for values of θ from –15° to +15°.

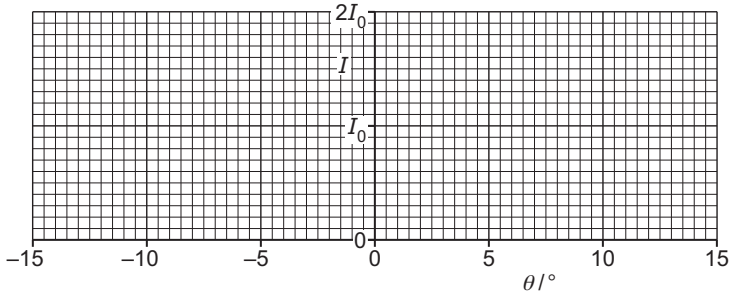


Fig. 4.2

[3]

(c) A polarising filter is placed in the path of the light beam that is incident on the diffraction grating in Fig. 4.1. The transmission axis of the filter is at 45° to the vertical.

Suggest how the variation of intensity with θ for the light on the screen compares with the answer in **(b)(iii)**.

.....

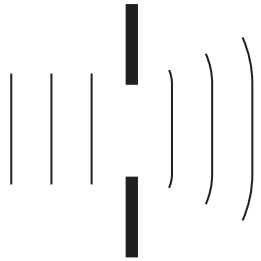
.....

..... [2]

[Total: 10]

30 A ripple tank contains water at a constant depth.

A water wave of constant frequency travels towards a gap in a barrier placed in the ripple tank.



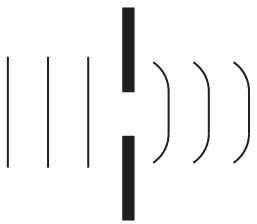
The gap is made smaller.

Which diagram represents the wave before and after the barrier?

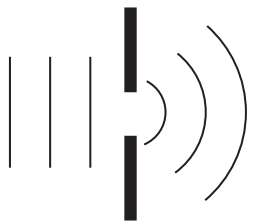
A

B

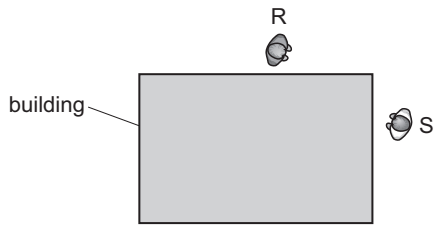
C



D



26 A student makes a sound at point R near a building. A second student, standing at point S around the corner of the building, hears the sound. The building is a solid structure and there are no other structures nearby.



Which effect best explains how the student at point S is able to hear the student at point R?

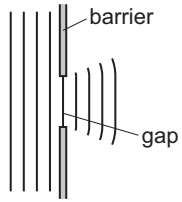
A diffraction

B interference

C polarisation

D reflection

28 The diagram shows a water wave in a shallow tank. The wave is diffracted through a gap in a barrier and spreads. The wavelength of the wave is much smaller than the width of the gap.



The wavelength of the wave and the width of the gap are both changed by a small amount.

Which combination of changes **must** increase the amount of spreading due to diffraction?

	wavelength	width of gap
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases