4 **(a)** Two waves are of the same frequency.

Explain with the aid of a diagram what, for the two waves, is meant by *phase difference*.

.....

.....[2]

(b) Monochromatic light is incident normally on a double slit as shown in Fig. 4.1. Light passes through the two slits B and C and is incident on the screen.

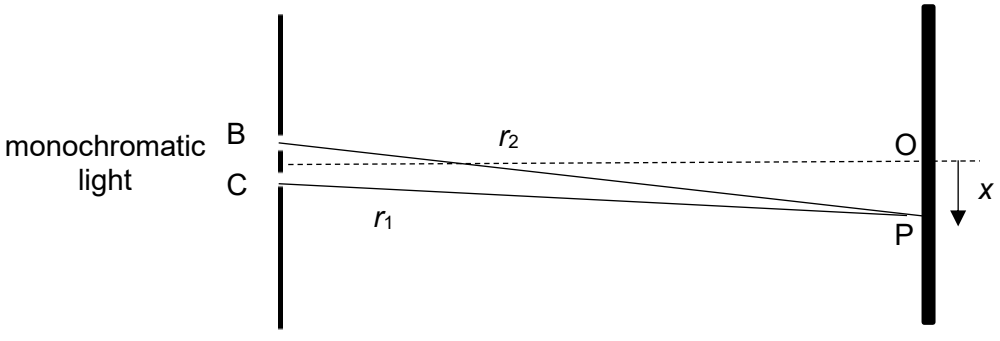

Fig. 4.1

The centre of the interference pattern formed on the screen is at O. The separation between the fringes is *y*.

r_1 and r_2 are two waves arriving at P.

(i) **1.** Deduce the relationship between the phase difference of the two waves arriving at point P and the distance *x* from point O.

[1]

2. The waves have a phase difference of 12.6 radians when they meet at point P. Distance OP on the screen is 5.2 mm. Calculate the separation *y* between the fringes.

y = ... m [2]

(ii) The light is adjusted so that the intensity of the light passing through slit B is reduced to a quarter that through slit C. The intensity of light from slit C alone at O is I. Deduce in terms of I, the intensity of the light at O due to the two slits.

intensity = ... [2]

(iii) Sketch, on Fig. 4.2, a graph to show the variation with distance *x* from point O of the intensity of light observed on the screen. Label your answer to **(b)(ii)** on Fig. 4.2. Ignore the single slit diffraction envelope.

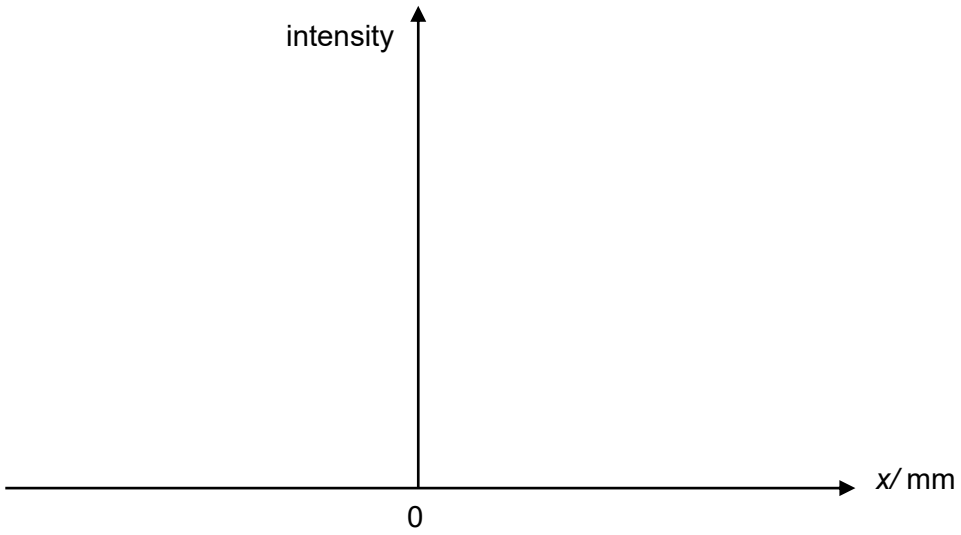

Fig. 4.2

[2]

[Total: 9]