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

.....

.....[2]

(b) An arrangement for demonstrating the interference of light is shown in Fig. 4.1.

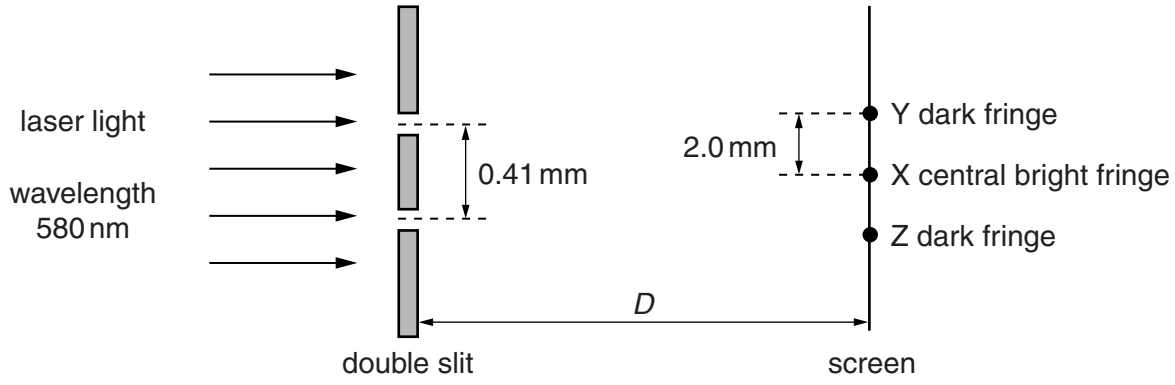

Fig. 4.1 (not to scale)

The wavelength of the light from the laser is 580 nm. The separation of the slits is 0.41 mm. The perpendicular distance between the double slit and the screen is *D*.

Coherent light emerges from the slits and an interference pattern is observed on the screen. The central bright fringe is produced at point X. The closest dark fringes to point X are produced at points Y and Z. The distance XY is 2.0 mm.

(i) Explain why a bright fringe is produced at point X.

.....

.....

.....

.....[2]

(ii) State the difference in the distances, in nm, from each slit to point Y.

distance = ... nm [1]

(iii) Calculate the distance *D*.

D = ... m [3]

(iv) The intensity of the light passing through the two slits was initially the same. The intensity of the light through **one** of the slits is now reduced. Compare the appearance of the fringes before and after the change of intensity.

.....

.....

.....

.....[2]

[Total: 10]