5 **(a)** State the *principle of superposition*.

……

……

…….. [1]

(b) A double slit consists of two parallel slits. The separation of the slits is 1.5 mm.

Coherent light of wavelength 590 nm is incident normally on the double slits as shown in Fig. 5.1. A screen is placed 3.2 m away from the double slit. Fringes are observed on the screen.

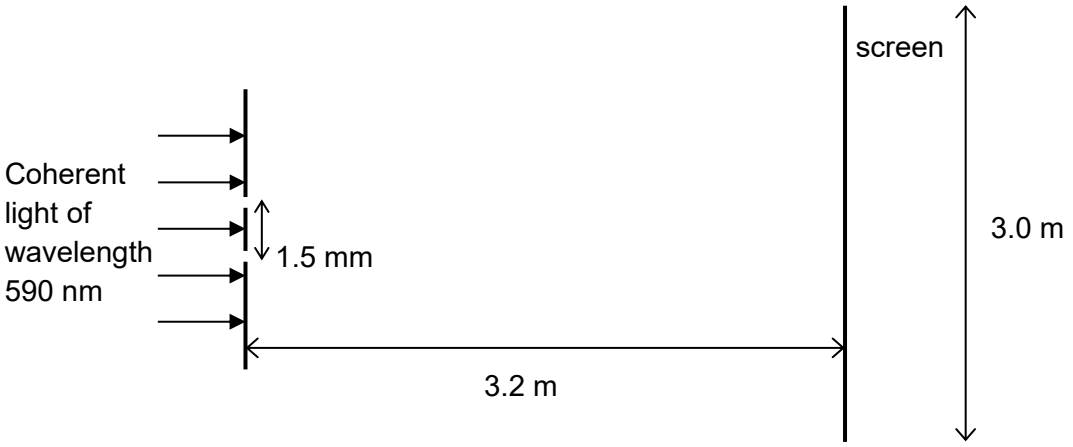

Fig. 5.1 (not to scale)

(i) Calculate the separation between the fringes.

separation = ……..… m [2]

(ii) The widths of the two slits are then increased while their separation is kept constant. Fringes are no longer observed.

Explain why the fringes are no longer observed.

……

……

…… [2]

(iii) The double slit is now replaced by a diffraction grating having 700 lines per millimetre. The same coherent light is now incident normally on the grating.

The screen is 3.0 m long as shown in Fig. 5.1.

Determine the maximum number of bright fringes that can be seen on the screen.

maximum number of bright fringes = ……..… [4]