4 **(a)** State three conditions that must be satisfied in order that two waves may interfere.

1. .....

2. .....

3. ..... [3]

(b) The apparatus illustrated in Fig. 4.1 is used to demonstrate two-source interference using light.

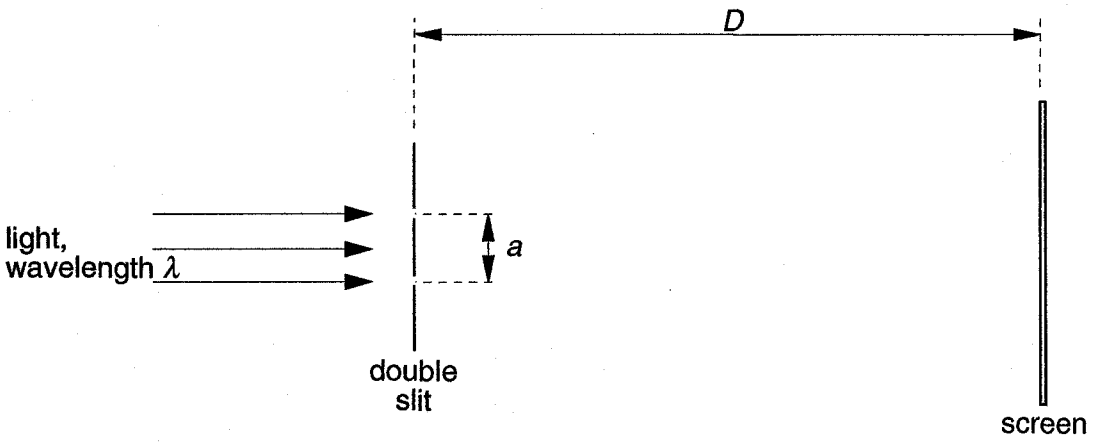

Fig. 4.1 (not to scale)

The separation of the two slits in the double slit arrangement is a and the interference fringes are viewed on a screen at a distance D from the double slit. When light of wavelength λ is incident on the double slit, the separation of the bright fringes on the screen is x.

(i) **1.** Suggest a suitable value for the separation a of the slits in the double slit.

.....

2. Write down an expression relating λ, a, D and x.

.....

[2]

(ii) Describe the effect, if any, on the separation and on the maximum brightness of the fringes when the following changes are made.

1. The distance D is increased to $2D$, keeping a and λ constant.

separation: .....

maximum brightness: .....

2. The wavelength λ is increased to 1.5λ, keeping a and D constant.

separation: .....

maximum brightness: .....

3. The intensity of the light incident on the double slit is increased, keeping λ, a and D constant.

separation: .....

maximum brightness: .....

[7]

[Turn over