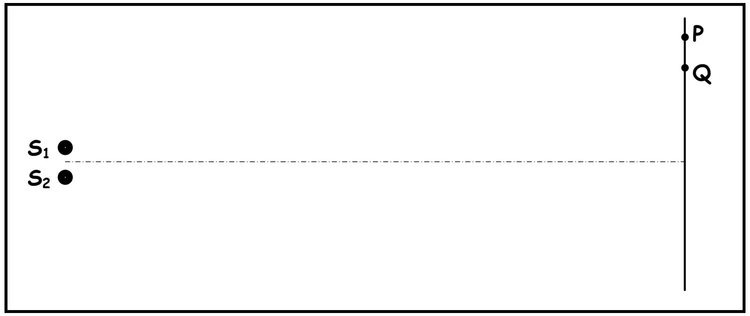
2 (a) A detector is moved in front of two identical coherent wave sources and detects regions of constructive and destructive interference. **Explain** the terms :

(i) **COHERENCE.** (ii) **PATH DIFFERENCE.**

(b) The diagram below shows two identical light sources S_1 and S_2 placed in front of a screen. The sources emit light in phase with each other.



(i) **State, in terms of the path difference of the waves,** the conditions necessary to produce :

1. Constructive interference at point **P** on the screen.
2. Destructive interference at point **Q** on the screen.

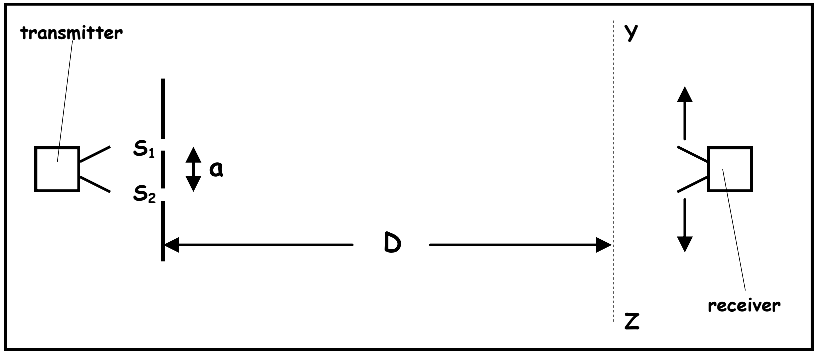
(ii) The light sources S_1 and S_2 are **0.50 mm** apart. They each emit light of wavelength 4.86×10^{-7} **m**. An interference pattern is produced on the screen placed **2.00 m** from the sources.
Calculate the **distance between two neighbouring bright fringes** on the screen.

(iii) Suggest how the appearance of the interference pattern would change if coherent **WHITE** light sources were used instead of the monochromatic sources.

(OCR AS Physics - Module 2823 - June 2007)

3 (a) Two coherent light wavetrains meet at a point and interfere **destructively.** Explain what this means and state **two** conditions that must be fulfilled before **TOTALLY DESTRUCTIVE** interference can occur. *11*

(b) The diagram below shows an experiment to demonstrate interference effects in microwaves. A transmitter, producing microwaves of **wavelength (λ),** is placed in front of two slits separated by a distance **(a).** A receiver is used to detect the strength of the resultant wave at different points in front of the slits.



(i) **Explain in terms of the path difference** between the wave trains, emerging fro the slits S_1 and S_2, why a series of interference maxima are produced along the line **YZ.**

(ii) Assuming that the interference of the microwaves is similar to the double-slit interference using light, state in terms of **a, D** and **λ,** an expression for the distance **x** between neighbouring **minima** on the **line YZ.**

(iii) Use your answer to (ii) to predict how **x** would change if the **distance a was doubled.**

(c) Explain why it is necessary to use a barrier with two slits rather than two separate transmitters.

(OCR AS Physics - Module 2823 - May 2002)