3 **(a)** A double-slit interference experiment is set up using coherent red light as illustrated in Fig. 3.1.

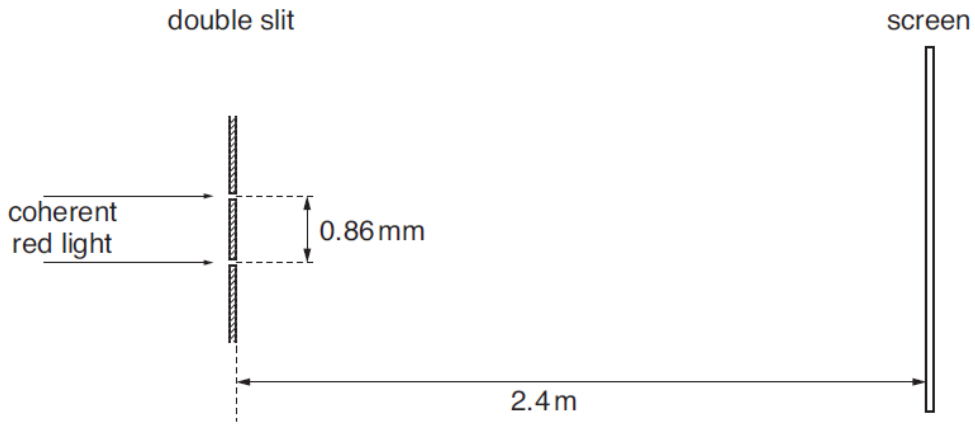

Fig. 3.1 (not to scale)

The separation of the slits is 0.86 mm. The distance of the screen from the double slit is 2.4 m. A series of light and dark fringes is observed on the screen.

(i) State what is meant by *coherent* light.

.....

.....

.....[1]

(ii) Estimate the separation of the dark fringes on the screen.

separation = ……mm [3]

(iii) Initially, the light passing through each slit has the same intensity. The source is adjusted so that the intensity of the light passing through one of the two slits is reduced.

State and explain the effect, if any, on the dark fringes observed on the screen.

.....

.....

.....

.....[3]

(b) Microwave ovens cook food by generating electromagnetic radiation that gets absorbed and converted into the internal energy of the atoms and molecules of the food. A device called a magnetron emits electromagnetic radiation of frequency 2.45 GHz from one side of the microwave oven as shown in Fig. 3.2. Standing waves are produced in the oven's interior.

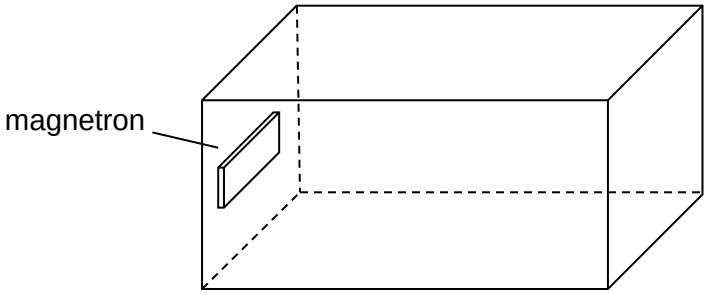

Fig 3.2

(i) Calculate the wavelength of the electromagnetic radiation produced.

wavelength = ……..m [2]

(ii) The standing wave set up in the microwave is as shown in Fig. 3.3. Label three points P, Q and R on the standing wave that oscillate in phase with the same amplitude.

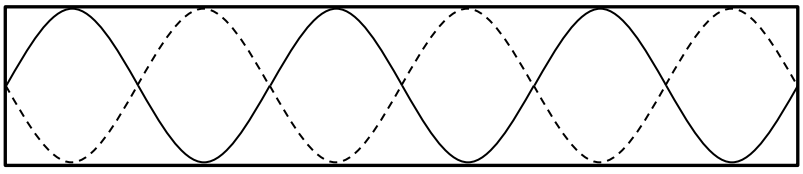

Fig 3.3 [2]