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

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(b) Interference effects are produced on a viewing screen as a result of interference of the direct waves from a 500 nm electromagnetic wave source S and reflected waves from the mirror as shown in Fig. 3.1.

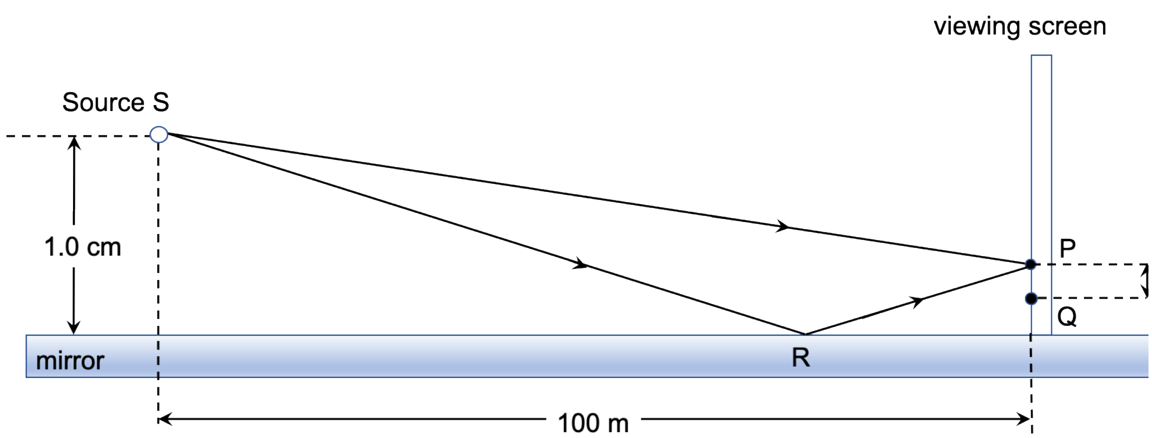

Fig. 3.1 (not to scale)

Points P and Q are at minimum intensity and there is only one point between P and Q which is at a maximum intensity.

S is placed 100 m to the left of the screen and 1.0 cm above the mirror.

(i) Explain why P is at a minimum intensity.

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…… [1]
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(ii) Calculate the distance *y*. Explain your working.

y = …… mm [3]

(iii) Describe and explain the changes observed at point P, if any, as a result of the following changes made independently to the experiment.

1. Source S is gradually shifted vertically further away from the mirror.

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…… [3]
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2. The mirror is replaced by a black cardboard.

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…… [2]
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