1 Fig. 1.1 shows two identical cylindrical metal conductors P and Q, each of length L and cross-sectional area A.

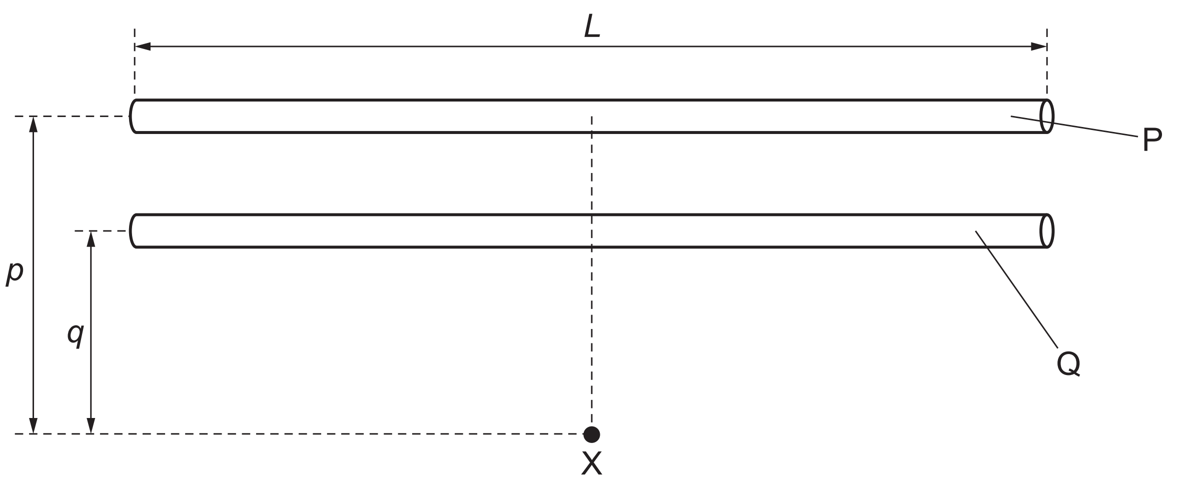

Fig. 1.1

The conductors are placed parallel to each other. The perpendicular distance from the midpoint of P to point X is p. The perpendicular distance from the midpoint of Q to point X is q.

The two conductors are electrically connected in parallel. This parallel combination is connected in series to a power supply and a resistor. The potential difference V between the ends of P is the same as the potential difference between the ends of Q.

The magnetic flux density at X due to the currents in the conductors is B.

It is suggested that B is related to p by the relationship

$$B = \frac{YAV}{Lp} + \frac{YZAV}{Lq}$$

where Y and Z are constants.

Plan a laboratory experiment to test the relationship between B and p.

Draw a diagram showing the arrangement of your equipment.

Explain how the results could be used to determine values for Y and Z.

In your plan you should include:

- the procedure to be followed
- the measurements to be taken
- the control of variables
- the analysis of the data
- any safety precautions to be taken.

Diagram

[15]