1 A thin solid disc of radius r and thickness z is attached to a thin axle. String is wrapped around the axle, as shown in Fig. 1.1.

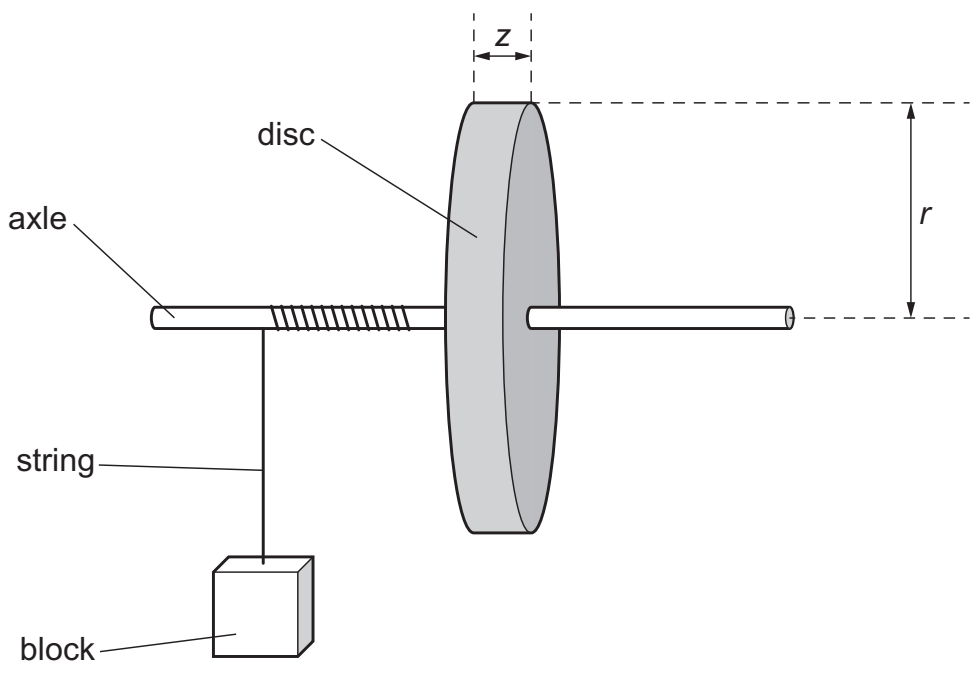

Fig. 1.1

A block of mass m is attached to the string.

The block is released from rest and falls downwards. The block has speed v when it has fallen through a distance h from the point of release. The value of v is determined using **one** light gate connected to a timer.

It is suggested that v is related to m by the relationship

$$\frac{h}{v^2} = \frac{\pi r^2 z}{2PQm} + \frac{1}{P}$$

where P and Q are constants.

Plan a laboratory experiment to test the relationship between v and m.

Draw a diagram showing the arrangement of your equipment.

Explain how the results could be used to determine values for P and Q.

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]