1 A ball is dropped on to an inclined thin metal sheet, as shown in Fig. 1.1.

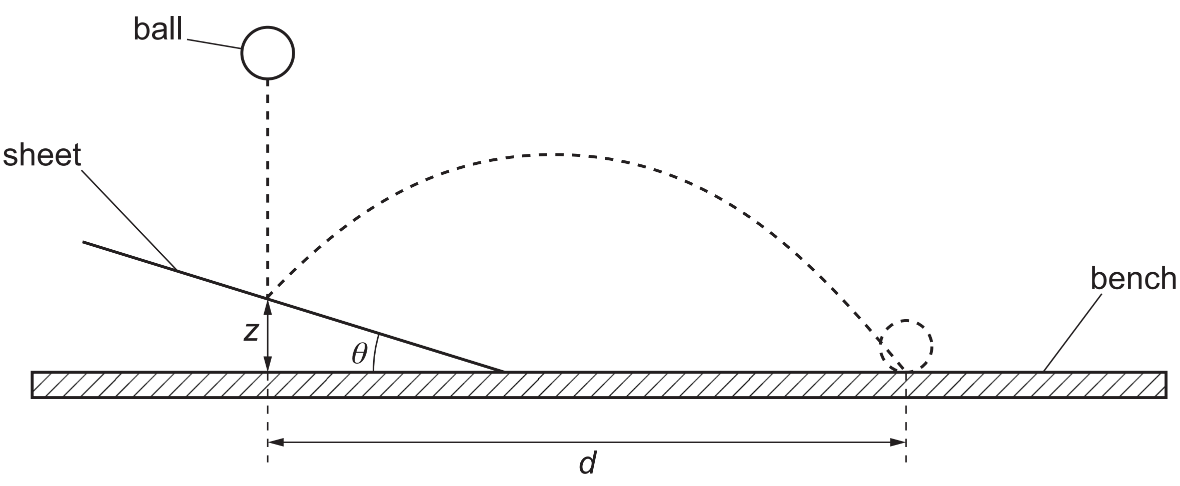

Fig. 1.1 (not to scale)

The angle between the sheet and the horizontal bench is θ. The height of the point of contact of the ball and the sheet is z. The horizontal distance travelled by the ball between its points of contact with the sheet and the bench is d, as shown in Fig. 1.1.

It is suggested that d is related to θ by the relationship

$$d = \frac{Pv^2 \sin 4\theta}{g} + Q\sqrt{z}$$

where v is the speed of the ball as it makes contact with the sheet, g is the acceleration of free fall, and P and Q are constants.

Plan a laboratory experiment to test the relationship between d and θ.

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]