1 Fig. 1.1 shows a model wind turbine with blades, each of length *L*, placed in moving air.

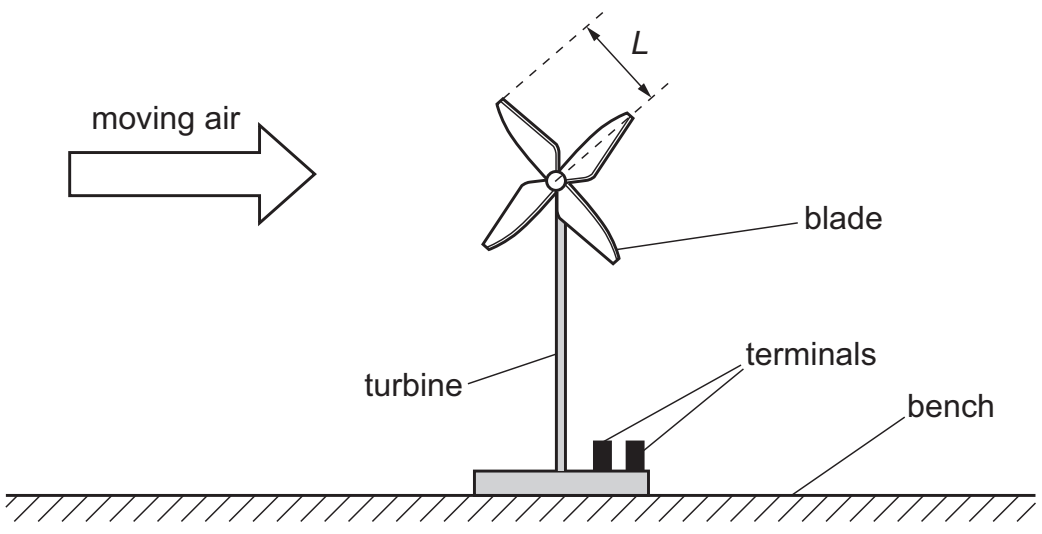

Fig. 1.1

The area of the circle swept by the blades of the turbine is *A*.

The output of the turbine has two terminals. The turbine is connected to a resistor of resistance *R*. At a speed *v* of the moving air, the current in the resistor is *I*.

The atmospheric pressure is *P* and the thermodynamic temperature of the air is *T*.

It is suggested that *I* is related to *v* by the relationship

$$\frac{I^2R}{Q} = \frac{APv^3}{2T}$$

where *Q* is a constant.

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

Draw a diagram showing the arrangement of your equipment.

Explain how the results could be used to determine a value for *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]