4

Answer **all** the questions in the spaces provided.

1 (a) Determine the SI base units of power.

SI base units of power .... [3]

(b) Fig. 1.1 shows a turbine that is used to generate electrical power from the wind.

wind speed *v*

L
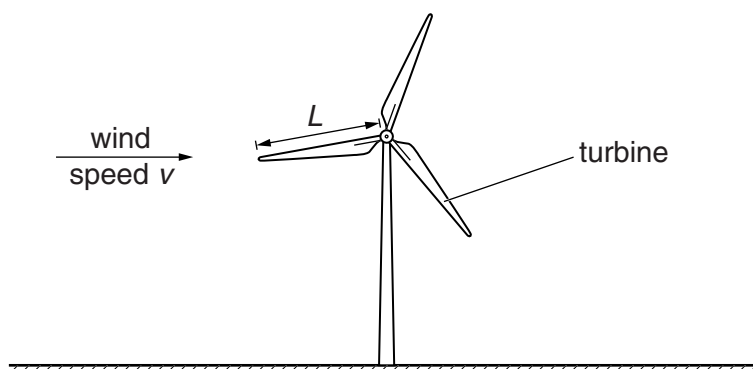
turbine

Fig. 1.1

The power *P* available from the wind is given by

$$P = CL^2\rho v^3$$

where   *L* is the length of each blade of the turbine,
        ρ is the density of air,
        v is the wind speed,
        C is a constant.

(i) Show that *C* has no units.

[3]

(ii) The length *L* of each blade of the turbine is 25.0 m and the density ρ of air is 1.30 in SI units. The constant *C* is 0.931.
The efficiency of the turbine is 55% and the electric power output *P* is 3.50×10^5 W.

Calculate the wind speed.

wind speed = ... $m\,s^{-1}$ [3]

(iii) Suggest two reasons why the electrical power output of the turbine is less than the power available from the wind.

1. ....

....

2. ....

....
[2]