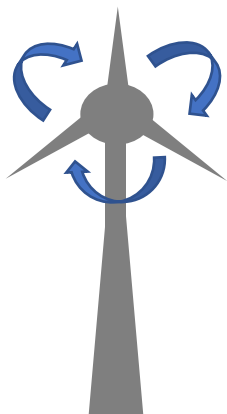


Wind Power

All answers to calculations should be to 2 significant figures.



1. Fill in the following word blanks

As the wind blows, it causes the **blades** of the **wind turbine** to turn, this will cause a **generator** to **turn** inside, producing electricity.

2. Fill in the table below to suggest advantages and disadvantages of using wind as an energy resource.

| Advantage of using wind as an energy resource | Disadvantage of using wind as an energy resource |
|---|---|
| No carbon dioxide produced | Can be noisy |
| Once set up they are low cost | Unreliable as wind speed varies |
| Low maintenance | Only suitable in certain locations |
| | Birds cannot see blades spinning |
| | Need a lot of wind turbines to generate electricity |

3. Suggest good locations for wind turbines and suggest poor locations for wind turbines

Good locations

Large open spaces such as fields, or in shallow ocean waters near the shore

Poor locations

Closed in spaces such as cities

4. Why do local people object to wind turbines being built in their local area ?

People complain about the noise generated and they do not like looking at them.

5. The eco-wind generation company are investigating which wind speed is best for generating the most electricity from wind turbines. They measure both the wind speed received by the turbine and the power generated by the turbine.

| Wind turbine | Wind Speed (m/s) | Power output (kW) |
|--------------|------------------|-------------------|
| A | 3 | 10 |
| B | 6 | 80 |
| C | 12 | 640 |

a. Describe the relationship between wind speed and power output

As wind speed doubles, power output multiplies by 8.

b. Explain the relationship between wind speed and power output.

Kinetic energy = $\frac{1}{2} \times \text{mass} \times \text{velocity}^2$

So, as wind speed doubles the mass doubles, so kinetic energy doubles.

As wind speed doubles, velocity will double, but because it is a squared quantity it will cause kinetic energy to quadruple.

Overall, kinetic energy will multiply by x2 then x4, so overall by x8 with the two effects combined.

Therefore, the power will also multiple by 8.