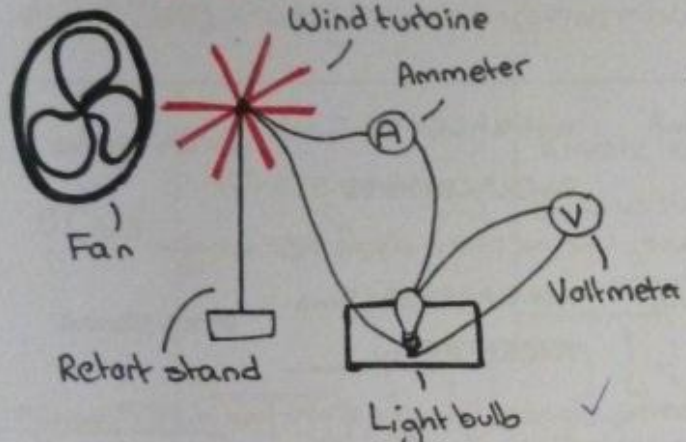
MAXIMUM POWER FROM A WIND TURBINE

DIAGRAM



METHOD

After setting up the circuit (see diagram) we used 6 of the longest blades at a 0° angle which resulted in no movement from the wind turbine. So, using the same arrangement, we angled the blades at 45° first to the right then to the left. We found that when the blades were at a 45° angle facing right, it produced more power than when they were facing left, so we continued to use this angle for the blades on the following tests.

The only problem we encountered (besides having a bit of trouble with the setup) was that our voltmeter was low on battery and malfunctioned a couple of times.

As far as collecting data went, we recorded the lowest and highest points of the current and voltage and worked out the averages for each.

In our group investigation, we all worked together to set it up and then [redacted] put together the blade arrangement, [redacted] analysed the voltmeter and ammeter readings and [redacted] collected the data.

RAW DATA

- 6 long blades (red), every second space, facing right at a 45° angle:

C = lowest: 42.4mA	highest: 43.8mA	AVERAGE = 43.1mA	P = 105.60mW
V = lowest: 2.40V	highest: 2.94V	AVERAGE = 2.45V	

- 6 long blades (red) in every second space, facing left at a 45° angle:

C = lowest: 20.1mA	highest: 20.9mA	AVERAGE = 20.5mA	P = 10.87mW
V = lowest: 0.51V	highest: 0.54V	AVERAGE = 0.53V	

RAW DATA (CONT)

- 3 long blades (red) and 3 medium blades (blue) alternating size in every second space, facing right at a 45° angle:

C = lowest: 34.1mA highest: 34.7mA AVERAGE = 34.4mA P = 55.38mW

V = lowest: 1.59V highest: 1.63V AVERAGE = 1.61V

- 6 long blades (red) and 6 medium blades (blue) alternating size in every space, facing right at a 45° angle:

C = lowest: 34.4mA highest: 34.8mA AVERAGE = 34.6mA P = 54.67mW

V = lowest: 1.54V highest: 1.62V AVERAGE = 1.58V

- 3 long blades (red) in every farth space, facing right at a 45° angle:

C = lowest: 29.4mA highest: 29.9mA AVERAGE = 29.65mA P = 35.58mW

V = lowest: 1.18V highest: 1.21V AVERAGE = 1.2V

- 6 medium blades (blue) in every second space, facing right at a 45° angle:

C = lowest: 47.1mA highest: 47.7mA AVERAGE = 47.4mA P = 137.46mW

V = lowest: 2.85V highest: 2.95V AVERAGE = 2.9V

- 12 long blades (red) in every space, facing right at a 45° angle:

C = lowest: 29.9mA highest: 30.8mA AVERAGE = 30.35mA P = 39.46mW

V = lowest: 1.27V highest: 1.33V AVERAGE = 1.3V

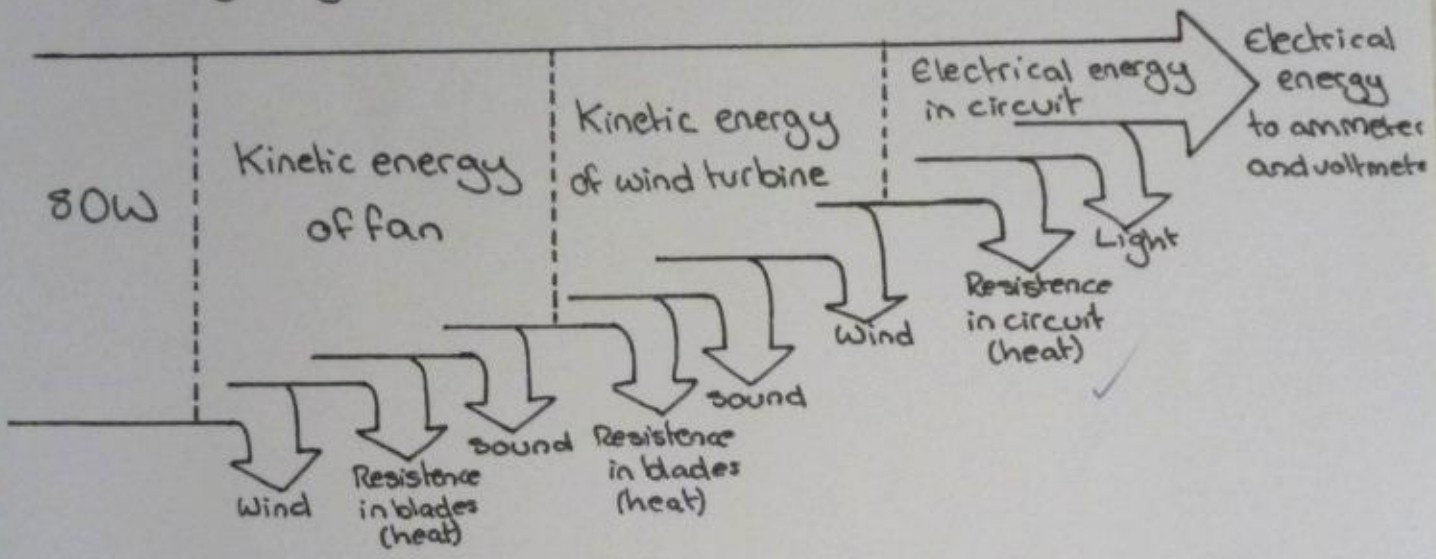
TOP 3 ARRANGEMENTS

ARRANGEMENT	CURRENT (A)	VOLTAGE (V)	POWER (W)
6 long blades (red) facing right	43.1mA	2.45V	105.60mW
3 long blades (red) and 3 medium blades (blue)	34.4mA	1.61V	55.38mW
6 medium blades (blue)	47.4mA	2.9V	137.46mW

DISCUSSION QUESTIONS

1. Energy generated for 6 medium blades (blue):
   137.46mW ÷ 1000 = 0.13747W × 60s = 8.2476J = 8.25J ✓

2. Sankey diagram:



3. Why did our wind turbine produce less than 80W? Because a large part of the power has been lost to blade resistence, scattered wind, heat, sound, electricity and light.

4. Renewable sources of energy are important because they don't emit greenhouse gases, create power without using fossil fuels and therefore don't contribute to global warming. Plus, they're renewable! ✓

CONCLUSION

In conclusion, we found that spacing the blades in every second space and putting them at a 45° angle facing right generated the most power. Even though using the medium length blades in this arrangement produced the most power out of all our tests, it was still only a fraction of the original 80 watts. ✓