Experiment:

Build & test a water turbine to determine what factors impact on the turbines rotations per minute.

Materials:

_____

_____

Choose which variable your group is going to look at:
Note: Each group should have a different variable.

Independent Variable	Model One	Model Two	Tick One
Size of wheel	Small	Large	
Position	Vertical blades	Horizontal blades	
Number of fins	5	10	
Material used for fins	Spoons	Plastic Blades	

Draw a labelled diagram showing the two models your group are going to build.

Model One:	**Model Two:**

Fill in the blanks:

The independent variable in my investigation is _____.
The dependent variable in my investigation is _____.
The constant variables in my investigations are _____,_____ and _____.

Tip: Colour one fin so that the counting of rotations is easier

Control Variables

Now that you have build your model, you must ensure that the flow rate of water is the **same** when testing both models. This can be done by ensuring that the water is not turned off/ adjusted between testing each model.
Alternatively, you can calculate the flow rate for each testing and ensure the flow rates are the same.

Calculate the flow rate of water:
1. Turn on the water. *(Tip: Slower flow rate will make it easier for counting the rotations)*
2. Time how long it takes to fill a litre bottle.
3. Convert time to seconds. *(Note: 1 minute = 60 seconds)*
4. Calculate flow rate in Litres per second. *(Note: 1 ÷ time taken to fill litre bottle in seconds)*
5. Repeat procedure 3 times.
6. Calculate an average value for the flow rate.
7. Ensure the flow rate is kept constant.

Time Taken to Fill Litre Bottle **Seconds (s)**	Flow Rate (One Litre ÷ time in seconds) **Litres per second (L / s)**

Average flow rate:

$$\frac{(Flow\ Rate\ 1) + (Flow\ Rate\ 2) + (Flow\ Rate\ 3)}{3}$$

Average flow rate = _____ L / s

Checklist:

	Tick if this has been done.
Flow rate is the same for each test.	
The height from water source to water turbine is the same.	
The turbine rotates in the same direction for each test.	
The water hits the turbine at the same position in each test.	

Printable recording tables for collecting data.

Size of Turbine Wheel	Number of Rotations per Minute RPM
Small	
Large	

Position	Number of Rotations per Minute RPM
Vertical	
Horizontal	

Number of Fins	Number of Rotations per Minute RPM
5	
10	

Material Used for Fins	Number of Rotations per Minute RPM
Spoons	
Plastic Blades	

*(**Note:** Students should repeat measurements three times and calculate an average for 'Number of Rotations per Minute')*

Conclusions

- **Size of turbine wheel:**
  The _____ turbine rotated the fastest at _____ rotations per minute.
  The difference between the small and large turbine was _____RPM.

- **Position of turbine wheel:**
  The _____ turbine rotated the fastest at _____ rotations per minute.
  The difference between the vertical and horizontal turbine was _____RPM.

- **Number of fins on the turbine wheel:**
  The _____ turbine rotated the fastest at _____ rotations per minute.
  The difference between the 5 blades and 10 blades turbine was _____RPM.

- **Materials used to make the fins/blades:**
  The _____ turbine rotated the fastest at _____ rotations per minute.
  The difference between the 5 blades and 10 blades turbine was _____RPM.

Looking at these conclusions - If you were an engineer, what design would you choose for your turbine?

_____

_____

_____

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