Hydro Turbine

**Name(s):**   **Date and subject:**

Build the Hydro Turbine
(building instructions booklets 4A and 4B, to page 20, step 30)

- Test the model's functionality. Loosening bushings can reduce friction
- Connect the plugs properly by pressing them firmly together
- Make sure to return the joules (J) reading to zero before testing
- Choose a suitable, constant water pressure that shows at least 2.0 V on the Energy Meters input reading
- When the pressure point is found, mark the tap handles position with a piece of adhesive tape
- Gently turn the blades to get the hydro turbine started if needed
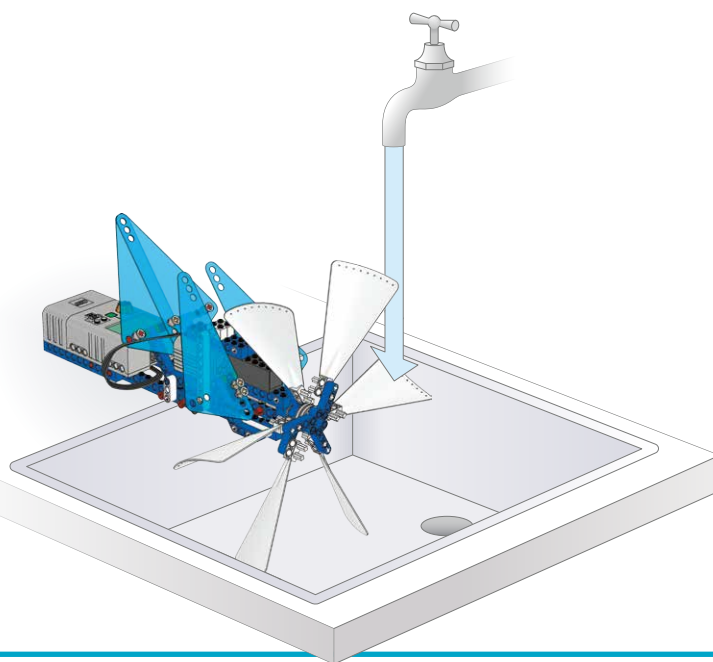
Accumulating Joules
First, predict how many joules (J) the hydro turbine will accumulate after a time period of 120 seconds (sec.) at 20 second intervals.

Then, graph your prediction in a system of coordinates, as illustrated opposite.

Next, investigate how many joules can be accumulated after a period of 120 seconds. Read and record your findings at 20 second intervals. Graph your findings in the same system of coordinates as your prediction. Remember to reset the Energy Meter before each investigation.

- - - - Prediction
———— Findings
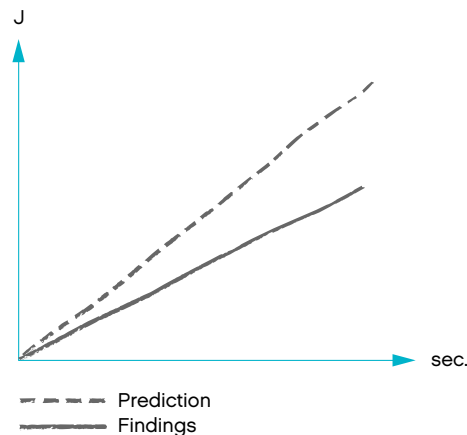
	20 sec.	40 sec.	60 sec.	80 sec.	100 sec.	120 sec.
My Prediction	(J)	(J)	(J)	(J)	(J)	(J)
My Findings	(J)	(J)	(J)	(J)	(J)	(J)

## Changing the Number of Blades

(building instructions booklets 4A and 4B, to page 22, step 2)

Change the number of blades on the hydro turbine by removing three blades and follow the same procedure as previously. Keep the same water pressure as before.

First, predict how many joules (J) the hydro turbine will accumulate after a time period of 120 seconds (sec.) at 20 second intervals.

Then, graph your prediction in a system of coordinates, as illustrated opposite.

Next, investigate how many joules can be accumulated after a period of 120 seconds. Read and record your findings at 20 second intervals. Graph your findings in the same system of coordinates as your prediction. Remember to reset the Energy Meter before each investigation.

J

sec.

- - - - Prediction
———— Findings
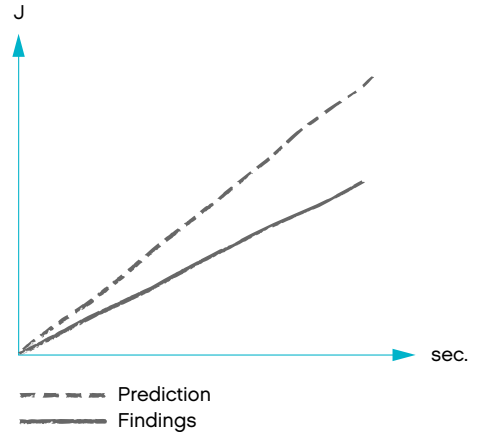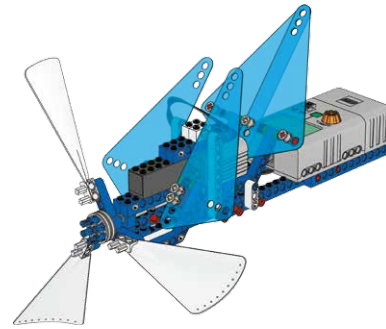
	20 sec.	40 sec.	60 sec.	80 sec.	100 sec.	120 sec.
My Prediction	(J)	(J)	(J)	(J)	(J)	(J)
My Findings	(J)	(J)	(J)	(J)	(J)	(J)

Identifying Variables

Identify and write down at least three variables, explaining clearly how these affect the efficiency of the hydro turbine.

_____

_____

_____

_____

_____

_____

Hydro Turbine

Name(s): _____   Date: _____

NGSS GOALS	BRONZE	SILVER	GOLD	PLATINUM

1. Student work related to this Crosscutting Concept:
In this project, we used scale and proportions to help us make predictions in our experiments and to help us explain how different variables affect our hydro turbine's efficiency.

| **Scale, proportion, and quantity:**

Use proportional relationships to gather information about the magnitude of properties. | • We tested our hydro turbine's functionality.
• We observed test measurements when the turbine was properly connected to the Energy Meter.

☐ | • We met Bronze.
• We used proportions (such as twice as much time will yield twice as much energy) to make our predictions in the six blade experiment.

☐ | • We met Silver.
• We used a proportional relationship to make our predictions for the three blade experiment.

☐ | • We met Gold.
• We labeled the line on our graphs with the proportions we observed (number of joules per second) in both experiments.

☐ |

2. Student work related to this Practice:
In this project, we created graphs to compare our predictions with our findings in our hydro turbine experiments. We also used our graphs to help see how different variables affected our turbine's efficiency.

| **Analyzing and interpreting data:**

Construct, analyze, and interpret graphical displays of data. | • We created a graph of our predictions in the six blade experiment.
• We labeled the independent and dependent axes.

☐ | • We met Bronze.
• We created a graph for our measurements in the six blade experiment.
• We analyzed our data to help us make a prediction in the three blade experiment.

☐ | • We met Silver.
• We created a graph for our predictions and measurements in the three blade experiment.
• We used the analysis of our data to help us explain how the number of blades affects our turbine's efficiency.

☐ | • We met Gold.
• We used the graphs of our data as a source of information to help us explain how other variables might affect the efficiency of our hydro turbine.

☐ |

3. Student work related to this Practice:
In this project, we identified variables and explained how those variables affected our hydro turbine's efficiency.

| **Constructing explanations:**

Construct a scientific explanation based on valid and reliable evidence obtained from student's own experiments. | • Our explanation for how different variables affected the hydro turbine's efficiency referred to what we discovered in our experiment.

☐ | • We met Bronze.
• We used numbers from our experiment to support our ideas.

☐ | • We met Silver.
• We explained how three different variables affect the hydro turbine's efficiency.

☐ | • We met Gold.
• We shared our explanation and evidence with classmates.
• We revised our explanation to make it more understandable.

☐ |

Notes: