ثانويـة التكنولوجيـا التطبيقيـة
Applied Technology High School

Technology Exploration-II

Module 2
Renewable Energy – **PRACTICAL TASKS ONLY**

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2.3 Practical Activity 1: Collecting Energy from Light with the LEGO Solar Cell

A solar cell generates electrical energy when light falls on it. In this practical task you will see how to collect electrical energy from light with a solar cell.

Figure 2.8 LEGO solar cell

1. Build the ferris wheel model on pages 4-15 of the Solar building booklet.
2. Attach the motor and LEGO solar cell to the ferris wheel and place it near the light source.
3. Switch the lamp on. Be careful, the lamp can get very hot.

    a) Count how many turns the ferris wheel makes in one minute (rpm). Complete the first row of the table.

    b) What was the speed of your ferris wheel? _____ rpm (rotations per minute).

4. Repeat step 3. This time, cover ¼ of the cell with thick card, then ½, then ¾ Complete the chart.

Cover	**rpm**
None	
¼	
½	
¾	

a) What happens? _____

b) Explain why: _____

c) What happens when you move the light nearer to the solar cell?

_____

d) Would it be a good idea to use solar cells to drive a fairground ride? Explain your answer.

_____

_____

5. Build the solar powered car on pages 20-23 of the Solar Building booklet.

6. Test the solar powered car. How can you make it go:
   a) Faster? _____
   b) Slower? _____
   c) Name some good reasons for using a solar cell on a car.
   d) Name some problems with using a solar cell on a car.

7. Investigate how the speed of the car changes when the "lamp to cell" distance is changed. Draw a graph of your results.

Graph:

Conclusion:

What have you learned from this practical task? Explain in your own words.

_____

_____

_____

_____

2.5 Practical Activity 2: Collecting Energy from the LEGO Windmill

Remember that you do work to lift weights. When you release the weights, they fall to the ground. Their potential energy is converted into kinetic energy. We can also store energy in a stretched elastic band.

Let's use the LEGO elastic band capacitor to store energy from the wind.

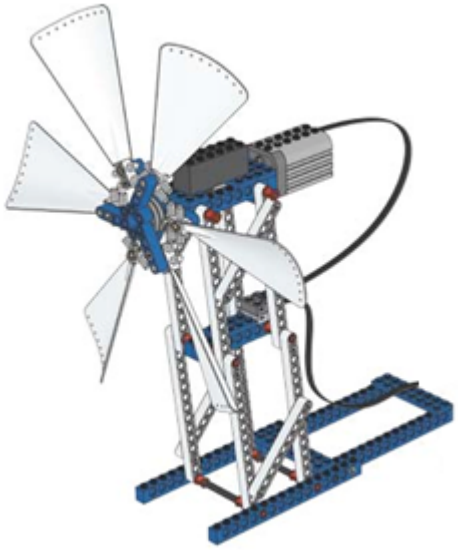

Figure 2.11 Wind Turbine

1. Build the windmill on pages 2-15 of the Wind building booklet.
2. Build the elastic band capacitor on pages 16-22 of the Wind building booklet and attach it to the windmill as shown in model-A on page 26 of the Wind building booklet.
3. Turn on the fan to charge the capacitor.

4. Turn off the fan. Unlock the capacitor to release its stored energy.
   a) What happens to the windmill?

      _____

   b) What happens to the windmill?

      _____

   c) Where did the energy come from to charge the elastic band capacitor?

      _____

5. Build the test car on pages 23-25 of the Wind building booklet.
6. Mark out a smooth test track.
7. Use the fan and windmill to recharge the elastic band capacitor.
8. Carefully remove the capacitor and put it on the car.
9. Put the car on the start line. Unlock the capacitor to release the stored energy. How far does the car travel? _____ (m)
10. Use a stopwatch to time the car over the test track. Find its average speed using the formula:
    Speed (m/s) = distance (m)/time (s)

2.7 Practical Activity 3: Collecting Energy from Water

Let's use a model waterwheel to collect energy from flowing water.

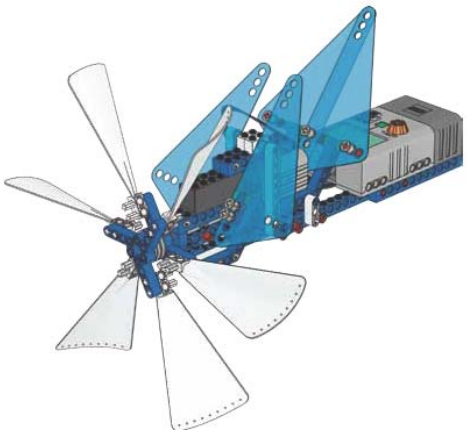

Figure 2.18 Waterwheel

1. Build the waterwheel on pages 2-14 of the Water building booklet.
2. Think about how you will provide consistent water flow.
   a) What happens to the waterwheel when you turn the tap on?

      _____

   b) How did you make sure the water flow was consistent?

      _____

3. Count how many turns the waterwheel makes in one minute. This is its speed in rotations per minute (rpm). What was the speed of your waterwheel?

   _____ rpm.

4. Build the winch shown on pages 22-25 of the General building booklet. Add weights to the winch until the waterwheel stalls (can't lift anymore). What is the stalling force? _____ N.

5. Change the water flow to the waterwheel. Repeat step 3 and 4. What is the rpm and stalling force now?

   _____ rpm _____ N

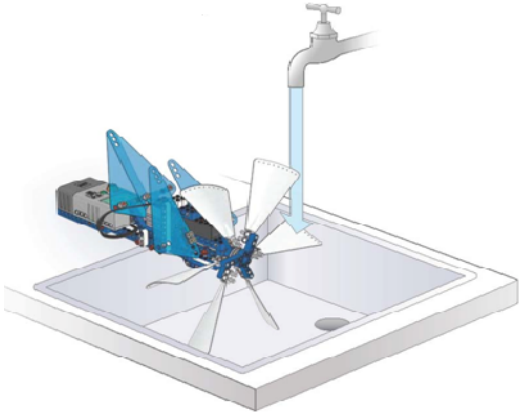

Figure 2.19 Hydro Turbine under Running Water

6. What form is the energy in:

   a) The water? _____

   b) The waterwheel? _____

   c) The weights at the top? _____

Conclusion:

What have you learned from this practical task? Explain in your own words.

_____

_____

_____

_____

2.8 Review Exercise

1. State two advantages of renewable energy sources:

_____

_____

_____

_____

2. Classify the following as renewable or non-renewable energy sources:

source	Renewable	Non-Renewable
Gas		
Wind		
Sun		
Water		
Coal		
geothermal		
Biomass		
Oil		

3. State three factors which could affect the efficiency of a wind turbine

_____

_____

_____

_____

_____

_____

_____

4. In groups, discuss the advantages and disadvantages of one renewable energy source, as shown in table below. Present your findings to the rest of the class. Search the internet to help you answer some of these questions.

Group	Renewable energy source
1	Solar Cells
2	Wind Turbine
3	Tidal Wave
4	Hydro Turbine
5	Geothermal