

Student Activities

These student activities are designed to be self-paced activities that students can complete independently or in small groups. Alternatively they can also be used as a teacher demonstration. All activity sheets can be downloaded in Microsoft Word formats so that teachers can edit the sheets to meet the needs of their students.

Energy Transformations

UTS remote lab rig: Hydro rig



Year level: 7, 8

Syllabus links:

[NSW Science Syllabus](#)

4.6.1 the law of conservation of energy

- a) identify situations or phenomena in which different forms of energy are evident
- b) qualitatively account for the total energy involved in energy transfers and transformations

[Australian Curriculum](#)

Year 8 Physical Sciences - Energy appears in different forms including movement (kinetic energy), heat and potential energy and causes changes within systems

Summary of student activity

Students control a water wheel to power four lights in a model house. Students control the amount the water valve is opened in order to control the amount of energy the water wheel generates to light up the house.

[Download the energy transformations student activity sheet](#)

A Model for Electricity

UTS remote lab rig: Hydro rig



Year level: 9, 10

Syllabus links:

[NSW Science Syllabus](#)

5.6.3 electrical energy

- b) describe voltage, resistance and current using analogies
- c) describe qualitatively the relationship between voltage, resistance and current

[Australian Curriculum](#)

Year 10 Physical Sciences - Energy conservation in a system can be explained by describing energy transfers and transformations

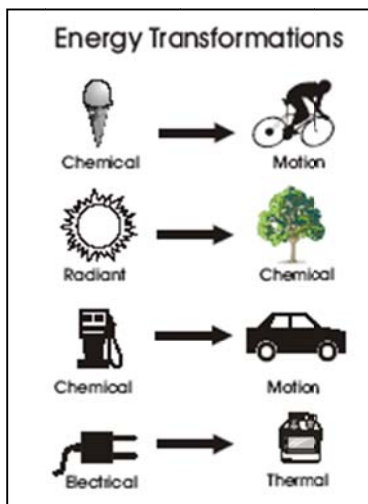
Summary of student activity

Students control a water wheel to power four lights in a model house. Students control the amount the water valve is opened to control the amount of energy the water wheel generates. Students collect data on flow rate, current and voltage.

Energy transformations

Energy is the ability to do work, which includes the ability to move something or to change the shape of something. Energy comes in different forms such as heat, light, motion, electrical, chemical, nuclear and gravitational. Types of energy can be sorted into two groups: stored (potential) or moving (kinetic).

Energy cannot be created or destroyed. Energy can only change from one type to another. While energy can change form, the total amount of energy in the universe stays the same. When one type of energy changes to another type, it is called an **energy transformation**. Energy transformations can be represented using arrows. Eg. chemical → kinetic means chemical energy has changed into kinetic energy.

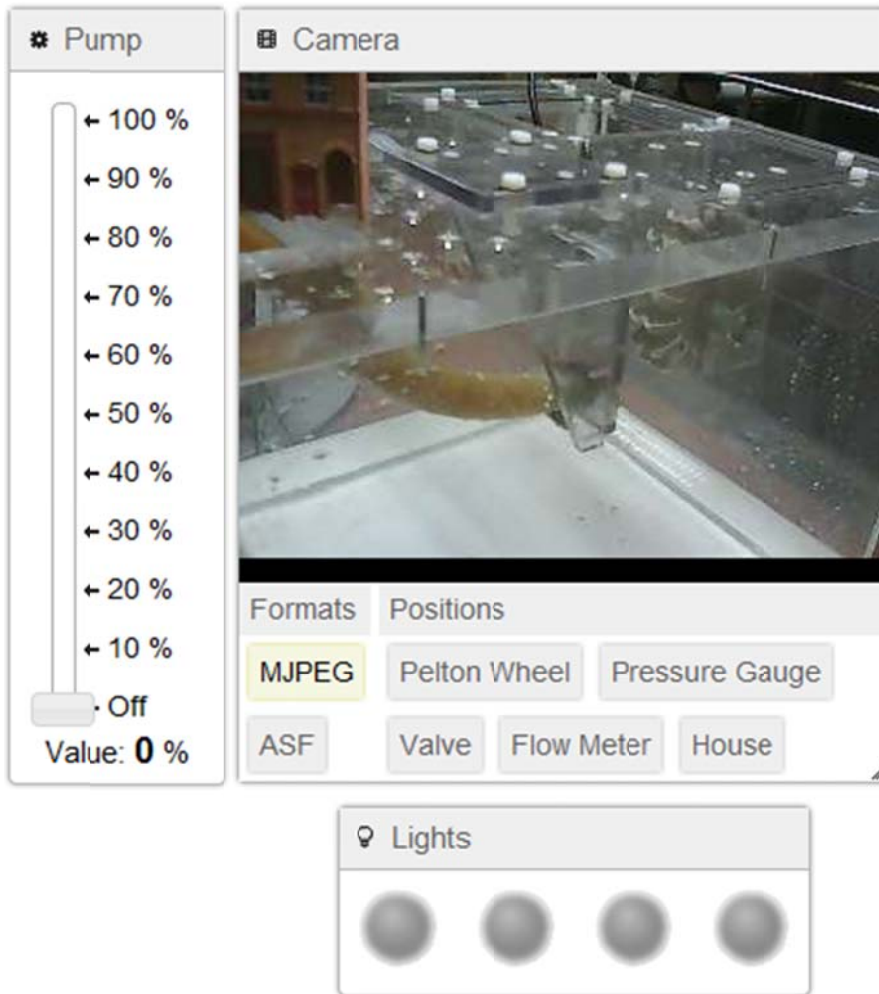


Source: National Energy Education Development Project (Public Domain)

Activity – Water wheel experiment

In this activity you will control a water wheel to see types of energy changing into other types of energy. Your teacher will help you log on to UTS remote labs to access the water wheel, in the Hydro rig.

1. Log on to UTS remote labs and select the Hydro rig.
2. Select the Basics 1 experiment.
3. Leave the valve pump at 0%. This means the pump is not turned on.
4. Explore the equipment by clicking on the Pelton wheel, pressure gauge, valve, flow meter and house.



5. Set the valve of the pump at 10%. This means the valve is opened at 10% its capacity. Observe the number of lights that turn on at the house and record the results in the table below.
6. Increase the valve to 20%. Observe the number of lights that turn on at the house and record the results in the table below.
7. Repeat step 6 but increase the valve percentage each time until your reach 100%.

Results

Pump valve opened at (%)	Number of lights turned on

Discussion questions

1. How do the lights at the house turn on and off?

2. What provides the energy to turn the lights on?

3. How does the energy that turns on the lights increase and decrease?

4. How do you know that energy has increased or decreased?

5. Use arrows to list as many energy transformations you can find in the Hydro rig.
Eg. *kinetic energy* → *electrical energy*

6. How does the energy provided by the pump compare with the energy used to turn the wheel and the energy used to turn on the lights?

A model for electricity

We all use electricity. Many modern gadgets like computers, televisions, tablets and SMART phones all need electricity to work. But what exactly is electricity? In these activities you will learn the basic components used to describe electricity and create a multimedia project to explain electricity to other high school students.



Activity 1 – Electricity as a form of energy

Go to <http://learnelectricity.ausgrid.com.au/Common/For-students/What-is-electricity.aspx>. Read the information under the headings “What is electricity”; “A form of energy”; “Simple circuits”; and “A fluid analogy”.

Open a Microsoft Word document or OneNote to record your answers to these questions:

1. Define the law of conservation of energy.
2. Where does electrical energy come from?
3. Describe the basic components of simple circuits.
4. Define voltage, current and resistance.
5. In the interactive activity “Comparing a DC Circuit to the Flow of Water:
 - (a) What happens to the flow of water when the pump speed is increased?
 - (b) What happens to the amount of electron flow when the voltage is increased?
 - (c) Complete this table to compare the parts of a water tank to a DC circuit.

Part of the water tank	Part of a DC circuit
Pump	
Water flow	
Size of pipes	

Activity 2 – Remote lab hydro rig

Your teacher will provide you with instructions on logging into UTS remote labs

1. Log onto UTS remote labs and queue for the Hydro rig.
2. Select “6. Water flow and its effects”.
3. Move the scale on the pump to change the percentage capacity the pump is working on. The higher the percentage, the more pressure the water is coming out of the pump.
4. Use a Microsoft Word document or OneNote to make these observations:
 - (a) What happens to the flow rate, current and voltage as the pump percentage is increased?
 - (b) What happens to the lights in the house as the pump percentage is increased?
5. Give reasons to the observations you recorded in question 4.

Activity 3 – Make a product to explain electricity

Run the Hydro rig again. This time use Debut Video capture to record a screencast of the experiment. Import the video into a video editing program such as Windows Movie Maker or Adobe Premier Elements and create a short video that explain how the Hydro rig changes kinetic energy into electrical energy and how the Hydro rig can be used to explain voltage, current and resistance.

Alternatively, you can take screenshots of the experiment and make another form of multimedia presentation such as a PowerPoint presentation or a Prezi presentation.