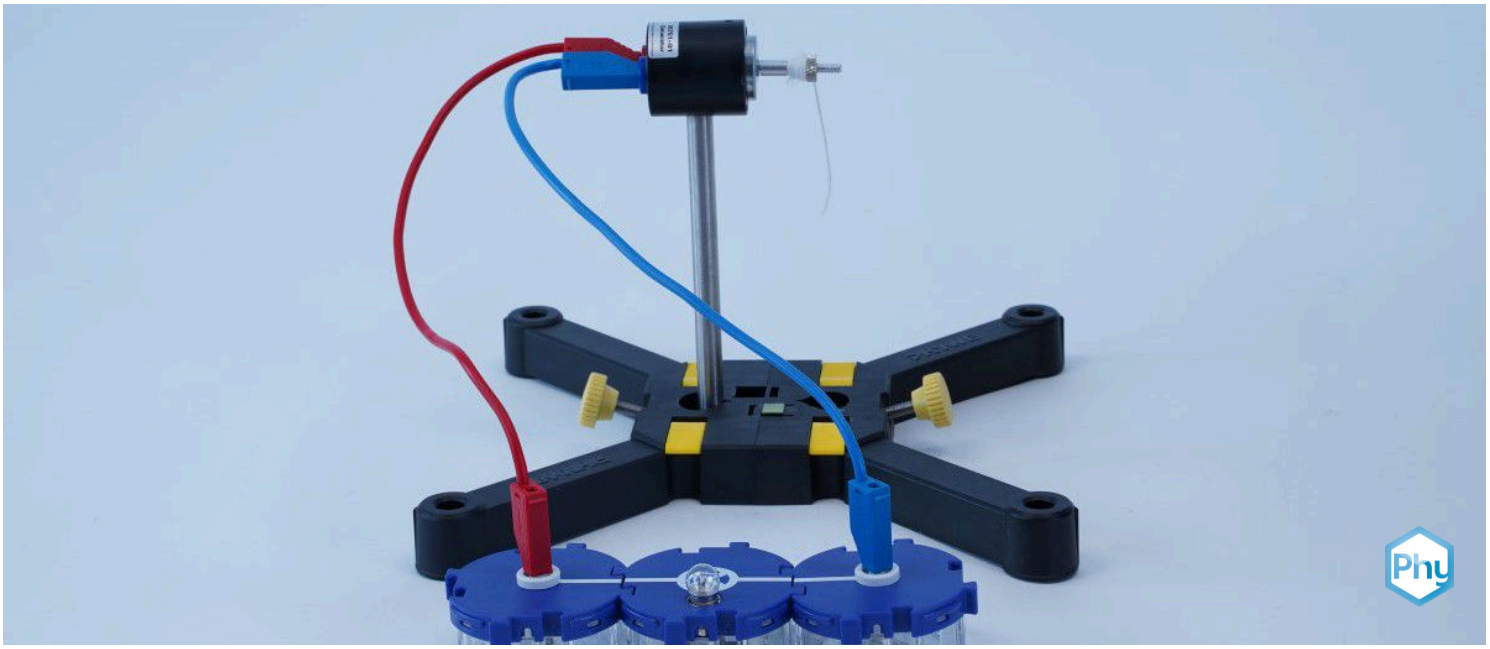
Conversion of mechanical energy into electrical energy



Physics > Energy > Energy forms, conversion & conservation

Difficulty level	Group size	Preparation time	Execution time
easy	1	10 minutes	10 minutes

This content can also be found online at:

http://localhost:1337/c/6167df092d1cf30003518c29

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Teacher information

Application

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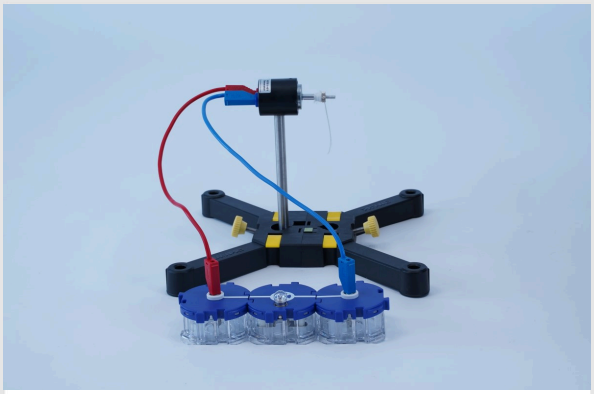

The experimental setup

The conversion of mechanical energy into electrical energy plays an essential role in renewable energy sources.

Both wind and various hydroelectric power plants use naturally occurring motions to generate electricity.

In this experiment, the energy conversion from kinetic energy to electrical energy is demonstrated to the students using a mechanically operated generator that powers a light bulb.

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Other teacher information (1/3)

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Previous

Students should be familiar with the basic forms of energy and the concept that energy can be converted from one form to another.

Principle

In this experiment, students will operate a generator by pulling a string and use the electrical energy generated to light a light bulb.

The correlation between the way the string is pulled and the luminous behaviour of the bulb is interpreted physically.

Other teacher information (2/3)

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Learning

Students learn that a generator can be used to convert kinetic energy into electrical energy.

Tasks

Make the light bulb glow by supplying the connected generator with kinetic energy by pulling a string.

Now observe the luminous behaviour of the bulb.

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Other teacher information (3/3)

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Additional information

- The lamps used in the experiment have very different powers. It should be made clear to the pupils that pulling the string faster means supplying more mechanical energy.
- If the physical relationships between voltage, amperage and power are known, more detailed observations on the generation of electrical energy can be made in the additional task.

Safety instructions

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The general instructions for safe experimentation in science lessons apply to this experiment.

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Student Information

Motivation

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A bicycle with dynamo

Many bike lights these days are powered by a dynamo, as these small generators can provide constant power to the bike lights without the worry of running out of batteries.

Practically, this is done using the kinetic energy that automatically occurs when riding a bicycle.

In this experiment, the concept of converting motion energy into electrical energy is examined in more detail using an illustrative example.

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Tasks

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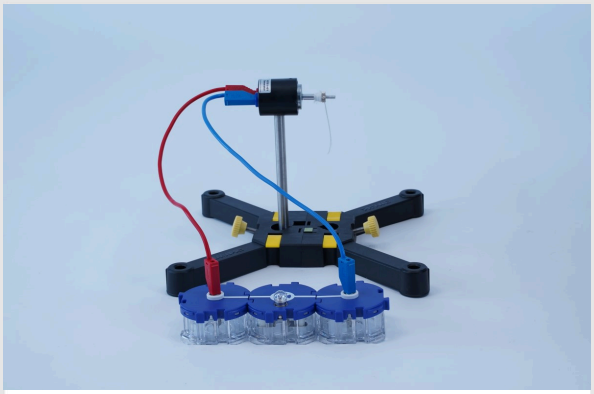

The experimental setup

Can you make lamps light up by turning the axle of a generator?

Drive a generator by pulling a string and observe how the connected light bulb behaves.

Conclude from your observations exactly how the conversion of kinetic energy to electrical energy behaves.

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Equipment

Position	Material	Item No.	Quantity
1	Support base, variable	02001-00	1
2	Junction module, SB	05601-10	2
3	Socket module for incandescent lamp E10, SB	05604-00	1
4	Generator with metrical thread axis and nut	05751-01	1
5	Fishing line, l. 20m	02089-00	1
6	Connecting cord, 32 A, 500 mm, red	07361-01	1
7	Connecting cord, 32 A, 500 mm, blue	07361-04	1
8	Filament lamps 1.5V/0.15A,E10,10 pieces	06150-03	1
9	Filament lamps 4V/0.04A, E10, 10	06154-03	1
10	Filament lamp 6 V/3 W, E10, 10 pcs.	35673-03	1

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Structure (1/2)

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Figure 1

Figure 2

1. Mechanical setup of the experiment according to Fig. 1 and Fig. 2.

Structure (2/2)

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2. Set up the circuit according to Figure 3-6. First insert the 4 V / 0.04 A lamp.

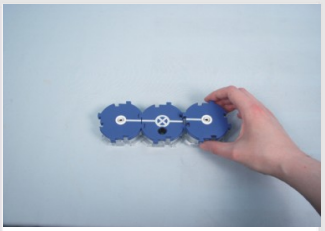

Figure 3

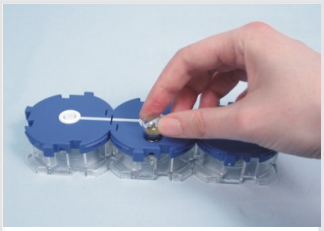

Figure 4

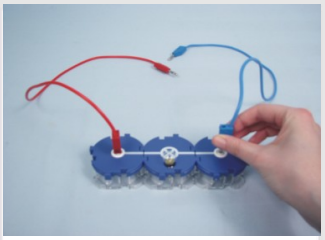

Figure 5

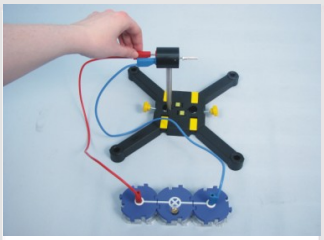

Figure 6

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Procedure

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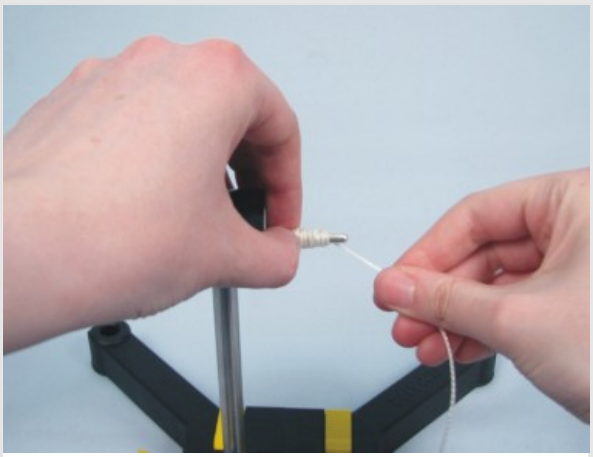

Figure 7

1. Wrap the string around the axis of the generator (Fig. 7).

2. Pull the string slowly the first time and then faster, watching the lamp.

3. Repeat the experiment with the lamp 1.5V/0.15 A, compare the brightness with the first lamp.

4. Put in the 6V/0.5A bulb. Can you make the lamp light up? Write down your observations in the protocol.

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Report

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Task 1

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Write down your observations on the light behaviour of the individual lamps.

Lamp	Luminous behaviour
4 V / 0.4 A	
1.5 V / 0.15 A	
6 V / 0.5 A	

Task 2

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What form of energy is supplied to the experimental setup by pulling the string?

- Electrical energy
- kinetic energy
- Thermal energy
- Light energy

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Task 3

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Kinetic energy is also called kinetic energy.

○ True ○ False

Check

The faster the string is pulled, the brighter the lamp shines.

○ True ○ False

Check

Task 4

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Drag the words into the correct boxes!

During the experiment, you couldn't get one of the _____ to light up, even if you pulled the string harder.
Explain this with the efficiency of the _____. This describes how much of the supplied energy is converted into the usable form of energy. The 6V bulb requires more _____ than the others, which the generator cannot generate by pulling alone.

light bulbs
generator
voltage

Check

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Slide	Score / Total
Slide 16: Move	0/1
Slide 17: Multiple tasks	0/2
Slide 18: Lamp	0/3

Total 0 / 6

Solutions Repeat Export text

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