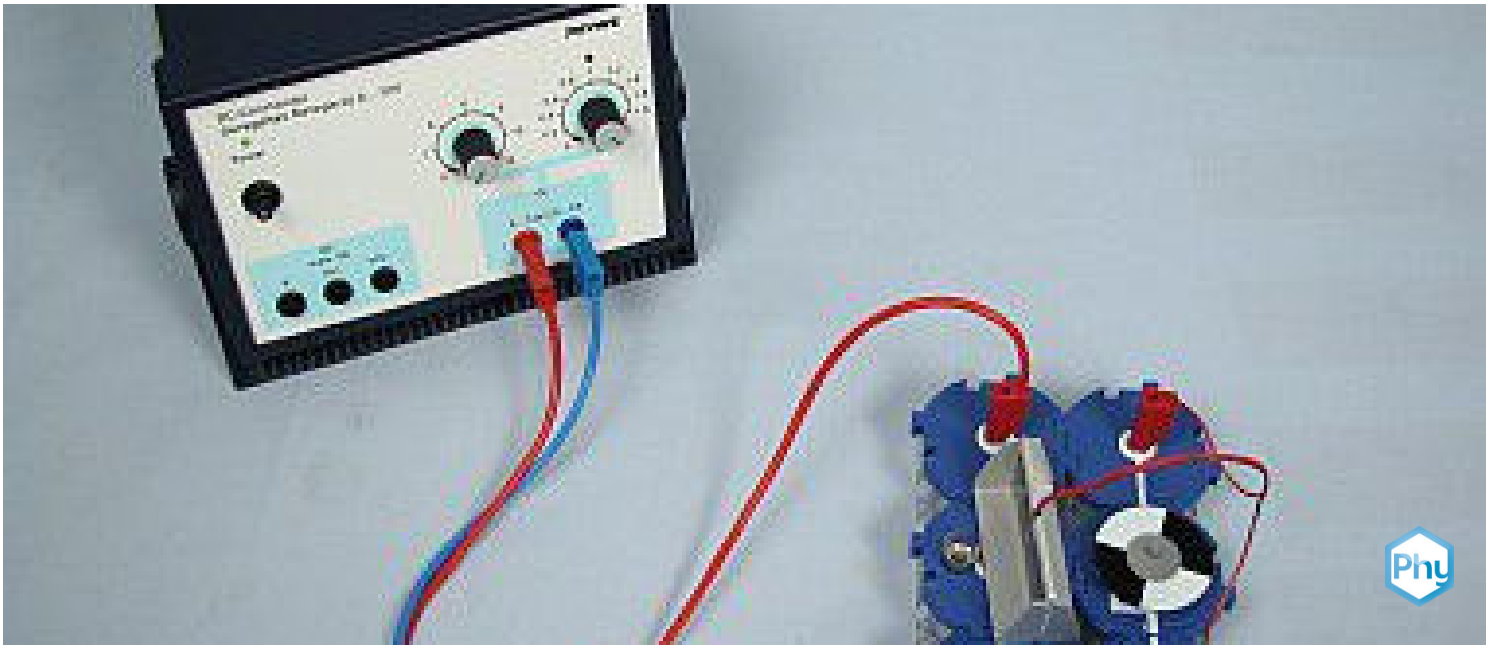
Converting light into motion with a solar cell



Physics | Energy | Energy forms, conversion & conservation

Difficulty level	Group size	Preparation time	Execution time
easy	2	10 minutes	10 minutes

This content can also be found online at:

http://localhost:1337/c/6167d8a22d1cf30003518a95

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General information

Application

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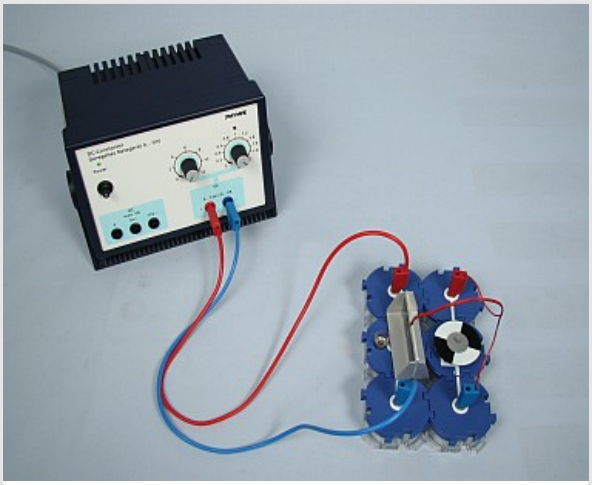

Experiment setup

Solar energy can be converted into electrical energy with the help of a solar cell.

This is a very important form of energy, both in the home and in industry, as it can be easily converted into other forms of energy, such as heat, light or mechanical energy (motion).

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Other teacher information (1/2)

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Previous knowledge

The students should have gained first experimental experience in using the student power supply.

Scientific principle

The solar cell plays an important role in the use of alternative energy sources, as it converts radiation energy from the sun directly into electrical energy.

The electrical energy generated is qualitatively very clearly demonstrated in this experiment by a small motor.

Here, by changing the voltage at the power supply unit, the relationship between illuminance and electrical power/speed of the motor is shown. An incandescent lamp is sufficient as the radiation source.

Other teacher information (2/2)

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Learning objective

In this student experiment, the conversion of solar energy into electrical energy is investigated.

Tasks

In the experiment, a small electric motor is operated with a solar cell.

Students illuminate a solar cell and observe the motor connected to it.

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Safety instructions

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

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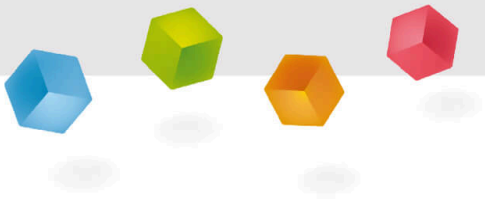

Student Information

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Motivation

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Solar cells on the roof of the SolarWorld GT experimental vehicle

Science is constantly striving to convert existing energy in such a way that it can be used by humans.

Even today, the conversion of light into electricity is part of everyday life.

If this principle can be efficiently extended to kinetic energy, it would be possible in the near future to get around using solar-powered vehicles and to dispense with the use of limited and environmentally harmful fossil fuels.

The Solarworld GT of the Bochum University of Applied Sciences serves as an application example here.

Tasks

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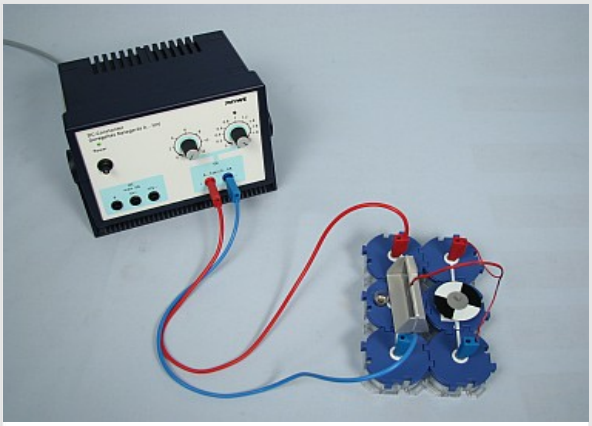

The experimental setup

Illuminate a solar cell and observe the motor connected to it.

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Equipment

Position	Material	Item No.	Quantity
1	Junction module, SB	05601-10	4
2	Socket module for incandescent lamp E10, SB	05604-00	1
3	Solar cell 3.3 x 6.5 cm, with plugs, 0.5 V, 330 mA	06752-09	1
4	Holder for solar cell 3.3 x 6.5 cm, with plugs	06752-08	1
5	Connecting cord, 32 A, 500 mm, red	07361-01	1
6	Connecting cord, 32 A, 500 mm, blue	07361-04	1
7	Filament lamp 6 V/3 W, E10, 10 pcs.	35673-03	1
8	Motor with indicating disc, SB	05660-00	1
9	PHYWE Power supply, 230 V, DC: 0...12 V, 2 A / AC: 6 V, 12 V, 5 A	13506-93	1

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Structure (1/2)

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1.Set up the lamp circuit (Fig. 1).

2.Set up the circuit for the motor (Fig. 2).

3.Put both rows of bricks together (Fig. 3).

4.Insert the solar cell into the holder (Fig. 4).

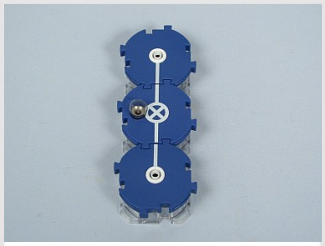

Figure 1

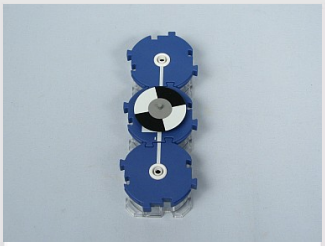

Figure 2

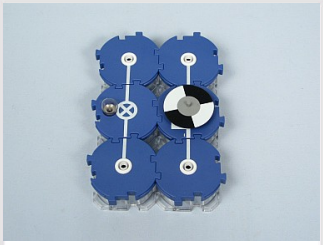

Figure 3

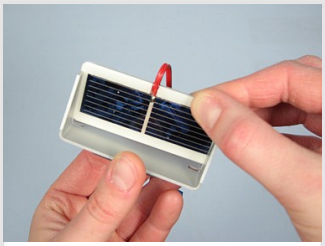

Figure 4

Structure (2/2)

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5. Connect the solar cell to the motor (Fig. 5).

6.Place the solar cell directly behind the light bulb (Fig. 6).

7.Connect the bulb to the power supply unit (Fig. 7).

The power supply is switched off and the adjusting knob for the voltage for the voltage (V) is set to 0 V.

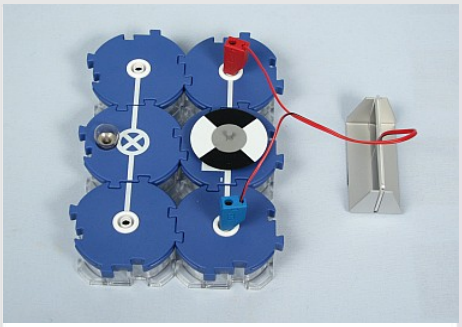

Figure 5

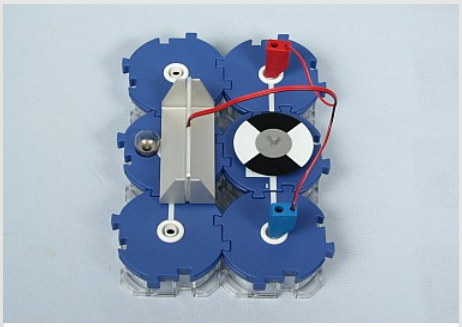

Figure 6

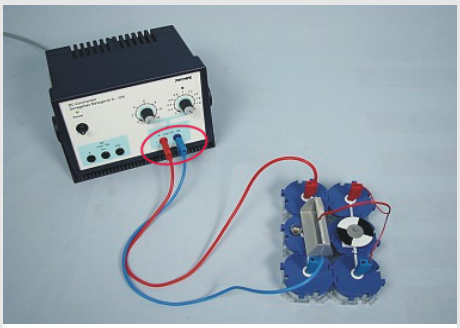

Figure 7

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Procedure

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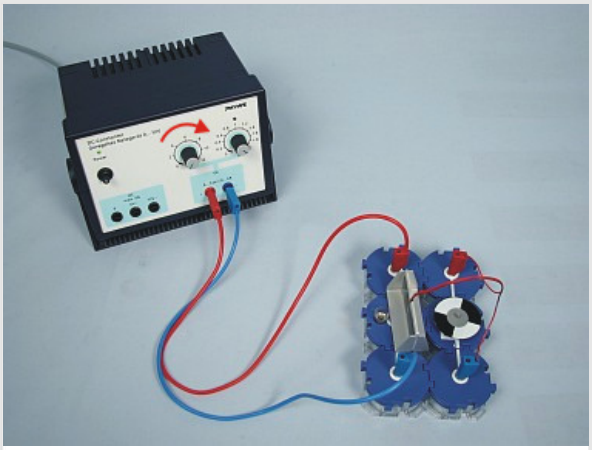

Figure 8

1. Switch on the mains unit.
2. Slowly turn the voltage control knob to 6 V (Fig. 8) while observing the motor and the bulb.
3. Try what happens when you bump the engine pulley a little.
4. Write down your observations in the protocol and explain them.

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Report

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Task 1

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Click on the correct terms in the text

The higher the lamp voltage, the stronger / weaker the lamp shines.

Only at a certain position / brightness of the lamp the motor starts to turn.

The brighter the lamp shines, the slower / faster the motor turns.

Check

Task 2

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What energy conversions take place in this experiment?

- ☐ kinetic energy ⇒ Electrical energy
- ☐ kinetic energy ⇒ Light energy
- ☐ Electrical energy ⇒ Light energy
- ☐ Light energy ⇒ Electrical energy
- ☐ Electrical energy ⇒ kinetic energy

Check

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Task 3

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Place the words in the correct gaps

The _____ are not completely efficient.
The light bulb in particular loses light and _____ to the environment.
One way to minimize the _____ is to use a larger _____.

solar cell
energy loss
heat
energy conversions

Check

Slide	Score / Total
Slide 14: Lamp brightness	0/3
Slide 15: Energy conversion	0/3
Slide 16: Energy loss	0/4

Total 0 / 10

Solutions Repeat

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