

## Lesson Plan: Electric Current (age 11 – 14) – The light output from a light bulb.

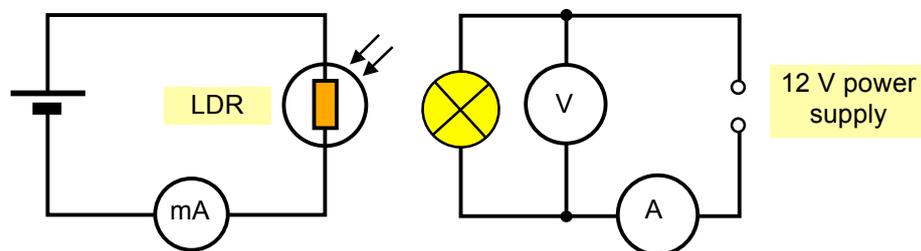
### Objectives:

By the end of the session students will understand the relationship between the output of light from a light bulb and the electrical power used by a light bulb.

### Lesson introduction (15 min):

Recap on previous learning on electric current. Explain experiment and learning objectives.

### Lesson activity (25 min):



Group students in pairs and task them to set up the two circuits shown in the diagram, one for the light bulb and one for the LDR. The current through the LDR will alter as the amount of light falling on it from the light bulb alters. Students to switch on the power supply and adjust the output until it is about 24W. This might be a voltage of 12V and a current of 2 A. The LDR is then moved towards the bulb until the milliammeter reads the biggest current that it can (do not let it touch the bulb). Students to record the current in the bulb, the voltage across it and the current in the milliammeter. The power supply to then be altered so that the bulb is a little dimmer, and another set of readings taken. This is to be repeated for two more power supply settings. The students are to record the results in a table.

### Lesson demonstration (15 min):

Select some of the students to inform the rest of the class about their findings. The remainder of the answers to the questions posed could be displayed for others to see and read. Demonstration experiment on Electric Current at [www.twothirtyvolts.org](http://www.twothirtyvolts.org) can be used to re-enforce learning.

### Lesson review (5 min):

Recap on learning from experiment and establish levels of understanding. Student Quiz on Electric Current at [www.twothirtyvolts.org](http://www.twothirtyvolts.org) can be used by students to test understand.

### Resources required:

A 12V 24W bulb, a variable voltage 12V dc power supply, leads, a light dependent resistor (LDR) such as an ORP12, milliammeter, voltmeter, ammeter and a battery pack (12 V).

### Expected Outcomes:

Students will understand the relationship between the output of light from a light bulb and the electrical power used by a light bulb and that the output is greater when more power is used.

## Student sheet: Electric Current – The light output from a light bulb.

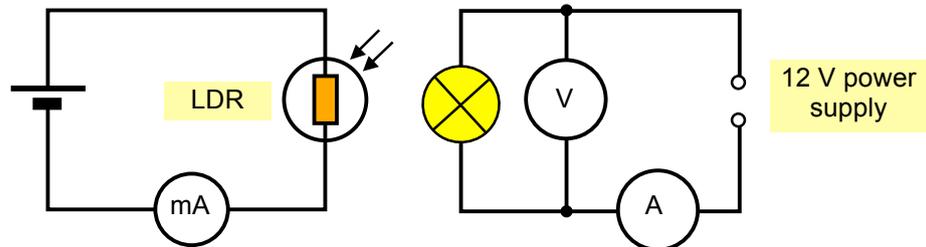
### Objectives:

By the end of the session you will understand the relationship between the output of light from a light bulb and the electrical power used by a light bulb.

### Resources required:

A 12V 24W bulb, a variable voltage 12V dc power supply, leads, a light dependent resistor (LDR) such as an ORP12, milliammeter, voltmeter, ammeter and a battery pack (12 V).

### Activity:



1. Set up the two circuits shown in the diagram, one for the light bulb and one for the LDR.
2. Switch on the power supply and adjust the output until it is about 24W. This might be a voltage of 12V and a current of 2 A.
3. Now move the LDR towards the bulb until the milliammeter reads the biggest current that it can (do not let it touch the bulb).
4. Record the current in the bulb, the voltage across it and the current in the milliammeter.
5. Now alter the power supply so that the bulb is a little dimmer, take another set of readings. Repeat this for two more power supply settings. Record your results in the worksheet.
6. Plot a graph of the current on the milliammeter against the electrical power of the bulb.

### Further work:

1. Use your apparatus to investigate how the distance from the light bulb affects the light falling on the LDR.
2. Use your apparatus to compare the light outputs from two different light bulbs both running at 24W.
3. Find out something about the regulations about how much light is needed in different parts of public buildings.

### Linked Resources

[www.twothirtyvolts.org](http://www.twothirtyvolts.org) :

Electric Current 11-14 Student Revision Notes

Electric Current 11-14 Additional Worksheet

Electric Current 11-14 Revision Quiz

**Worksheet: Electric Current – The light output from a light bulb.****Measurements to make:**

|                                |            |    |
|--------------------------------|------------|----|
| Current in the light bulb      | $(I_B) =$  | A  |
| Voltage across the light bulb  | $(V) =$    | V  |
| Current in the milliammeter    | $(I_R) =$  | mA |
| Electrical power of light bulb | $(VI_B) =$ | W  |

Plot a graph of the current on the milliammeter against the electrical power of the bulb.

**Questions:**

1. What can you say about how the output of the light bulb changes with the electrical power input?
2. What have you assumed about the LDR?
3. How much effect do you think other lights in the room had on the results?
4. How would you improve the experiment?

**Further work:**

1. Use your apparatus to investigate how the distance from the light bulb affects the light falling on the LDR.
2. Use your apparatus to compare the light outputs from two different light bulbs both running at 24W.
3. Find out something about the regulations about how much light is needed in different parts of public buildings.