

SPH3U UNIVERSITY PHYSICS

ELECTRICITY & MAGNETISM
⚡ Electric Potential Difference
(P.510-513)

Electric Potential Difference

Suppose that an electric stove element is connected to a battery and the element begins to heat up. If an ammeter is connected to the circuit it will measure a fairly large current. You might say that the element is "using electricity," but what does this mean? What does the element take from the current?



Electric Potential Difference


*As current passes through the stove element, it experiences opposition to the flow, resulting in a loss of energy and thus electric potential energy. This results in an **electric potential difference (V)** between two points in the circuit. Electric potential difference is measured in volts (V).*

ELECTRIC POTENTIAL DIFFERENCE (V)

- ❖ difference in electric potential between two points in a circuit
- ❖ also called voltage
- ❖ SI unit is volts (V)

Electric Potential Difference

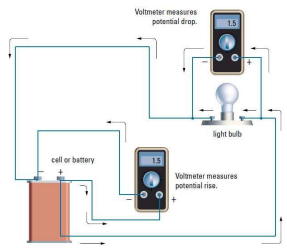
NOTE!
The energy lost is transferred to the molecules and atoms of the conductor as the current moves through it. This causes the element to heat up and glow – the electric potential energy has been changed into heat and light energy.



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Electric Potential Difference


*Electric potential difference between two points in a circuit is measured with a device called a **voltmeter**. It is connected across the path of the moving charges, as shown. This type of connection is called a **parallel connection**.*

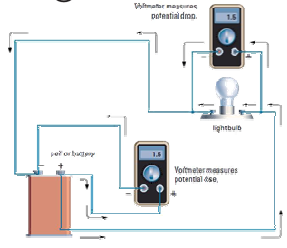


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Electric Potential Difference

VOLTMETER

- ❖ used to measure the potential difference between two points in a circuit
- ❖ connected in parallel with load
- ❖ circuit symbol is 



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Electric Potential Difference

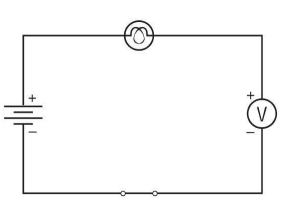
NOTE!
In an ideal circuit, the connecting wires and control device do not affect the amount of electric potential and therefore do not cause a voltage drop. However, in a real circuit, the connecting wires and control devices can cause a voltage drop.

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Electric Potential Difference

PRACTICE

1. A student connected a voltmeter into a circuit as shown. Is this the correct way to connect a voltmeter? Explain.



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Electric Potential Difference


PRACTICE

2. Identify what is wrong with each of the following statements, and rewrite it so that it is correct.

(a) A voltmeter must always be connected in series.

(a) A voltmeter must always be connected in parallel.
An ammeter must always be connected in series.

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 **Electric Potential Difference**


PRACTICE

2. Identify what is wrong with each of the following statements, and rewrite it so that it is correct.

(b) A series circuit has more than one complete path.

(b) A series circuit has only one complete path.
A parallel circuit has more than one complete path.

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 **Electric Potential Difference**


PRACTICE

2. Identify what is wrong with each of the following statements, and rewrite it so that it is correct.

(c) Connecting a voltmeter in series will allow only a small amount of electrical energy to travel through it.

(c) Connecting a voltmeter in parallel will allow only a small amount of electrical energy to travel through it.

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 **Electric Potential Difference**

PRACTICE

2. Identify what is wrong with each of the following statements, and rewrite it so that it is correct.

(d) A parallel circuit can only have two complete paths.

(d) A parallel circuit has more than one complete path.

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Electric Potential Difference

PRACTICE

2. Identify what is wrong with each of the following statements, and rewrite it so that it is correct.

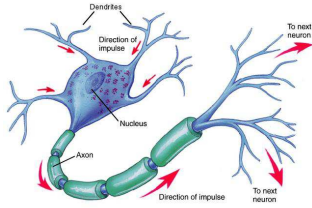
(e) A complete circuit contains a source of electrical energy and a load.

(e) A complete circuit contains a source of electrical energy, a load, connecting wires, and a switch.

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Electric Potential Difference – DYK?

An important part of the body's nervous system is the neuron, a nerve cell which can receive, interpret, or transmit electrical messages. An electric potential difference exists across the surface of every neuron because of a greater number of negative charges on the inside than on the outside. The potential difference is typically about 60 mV to 90 mV.



The diagram illustrates a neuron with several labeled parts: 'Dendrites' at the top, 'Nucleus' in the cell body, and 'Axon' extending from the cell body. Red arrows indicate the 'Direction of impulse' flow, starting from the dendrites, moving through the cell body, and then down the axon. Labels 'To next neuron' are placed at the end of the axon branches.

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✓ Check Your Learning

TEXTBOOK
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