

PHYZ SPRINGBOARD: CURRENT AND VOLTAGE



It is often difficult to distinguish current from voltage when first learning about electric circuits. The following exercise uses analogies to develop a conceptual distinction between the two. The analogies are neither perfect nor complete, but they should help you understand these otherwise abstract quantities.

Definitions

The rate at which charge flows, or the amount of charge that passes a point in a specific interval of time is current.

The amount of energy stored in a specific amount of charge is voltage.

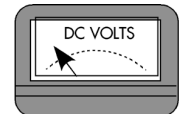
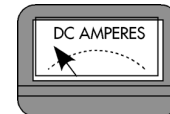
Analogies

In each case described below, characterize the "current" and "voltage." Draw a pointer needle on the ammeter to indicate the current and another on the voltmeter to indicate the voltage.

1. One dynastride dudette walking along as shown.

small current LARGE CURRENT

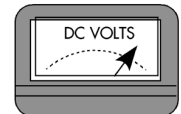
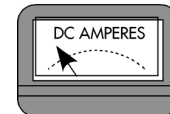
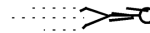
small voltage LARGE VOLTAGE



2. One circus dudette fired from a cannon.

small current LARGE CURRENT

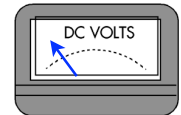
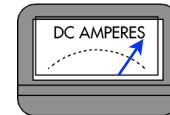
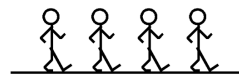
small voltage LARGE VOLTAGE



3. A large group of dynastride dudes walking along as shown.

small current LARGE CURRENT

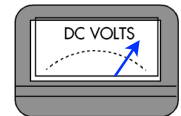
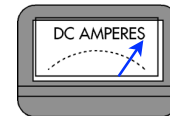
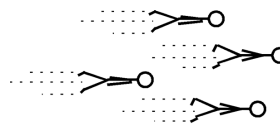
small voltage LARGE VOLTAGE



4. A fleet of circus dudes fired from multiple cannons.

small current LARGE CURRENT

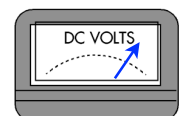
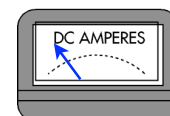
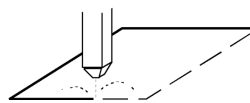
small voltage LARGE VOLTAGE



5. A high-pressure, narrow stream of water is used to cut through concrete.

small current LARGE CURRENT

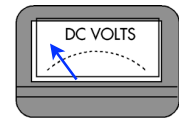
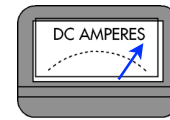
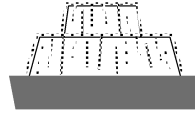
small voltage LARGE VOLTAGE



6. Water gently cascades over a large, stepped fountain.

small current LARGE CURRENT

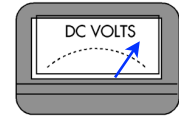
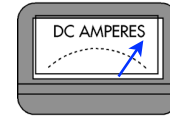
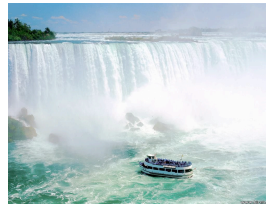
small voltage LARGE VOLTAGE



7. Water crashes into the base of Niagara Falls.

small current LARGE CURRENT

small voltage LARGE VOLTAGE

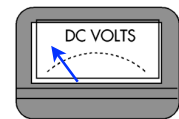
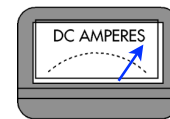


Make Your Own Analogies:*

8.

small current LARGE CURRENT

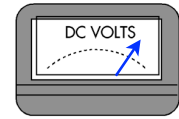
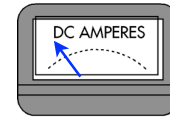
small voltage LARGE VOLTAGE



9.

small current LARGE CURRENT

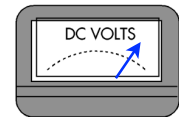
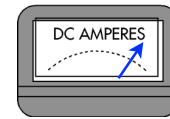
small voltage LARGE VOLTAGE



10.

small current LARGE CURRENT

small voltage LARGE VOLTAGE



Changes

11. Suppose a trickle of water were coming out of a hose. If the faucet controlling the flow of water to the hose were then "cranked up," what—if anything—would change in terms of current and voltage?

Both current and voltage increase.

12. Suppose one spillway gate of a large dam were open. If a second were then opened, what—if anything—would change in terms of current and voltage?

Current increases; voltage remains the same.

13. Suppose an adjustable shower head were configured to give a low-pressure flow. If it were then adjusted to give a high-pressure spray (without changing the rate of water usage), what—if anything—would change in terms of current and voltage?

Current remains the same; voltage increases.

*Hint: consider automobile traffic, for example.