# 9 Electric potential and voltage – Part 1

Name: _____ Class: _____ Date: _____

## Vocabulary

*Write each word three times.*

| **English** | **Write it 3 times** (English) | | |
|---|---|---|---|
| Electric potential | | | |
| voltage | | | |

## Recall

You use "voltage" all the time:

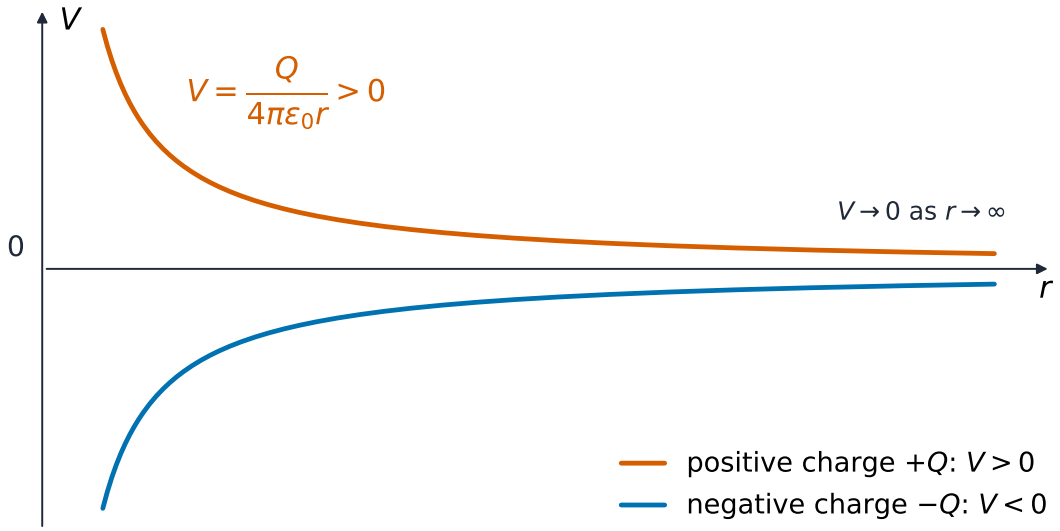
- Batteries are labelled 1.5 V, 9 V, and so on.
- Voltage is what pushes current around a circuit.
- It is really a measure of electric energy.

This sheet lines up electric potential and voltage. Each idea has a worked example.

## New ideas

### 1 Electric potential

**Electric potential** $V$ is the electric potential energy per unit of charge, measured in volts.



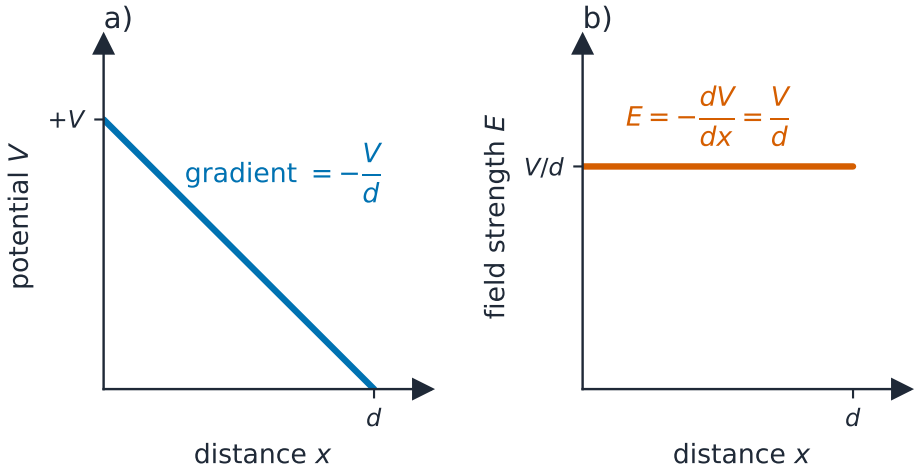

## 2 Voltage

The **voltage** (potential difference) between two points is the work done per unit charge to move a charge between them: $U = qV$.

*Worked example.* Moving a charge of 2.0 C through 6.0 V transfers $U = qV = 2.0 \times 6.0 = 12$ J.

## 3 Downhill for positive charge

A positive charge moves from **high** to **low** potential on its own – like a ball rolling downhill.




$E = -dV/dr$ · field = negative gradient of potential



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### ■ 4 A scalar

Potential is just a number (a scalar), so potentials from several charges simply **add** – much easier than adding field vectors.

**Watch out:** electric potential ($V$, a scalar) and electric field ($E$, a vector) are different things. Potentials add as plain numbers; fields must be added by direction as well as size.

## Practice

Try these in order. The methods are all above.

**2.1** State what electric potential measures. [2]

**2.2** Moving a 3.0 C charge through 4.0 V – find the energy transferred. [2]

**2.3** State which way a positive charge moves on its own (high to low potential, or low to high). [1]

**2.4** Moving a 0.5 C charge through 12 V – find the energy transferred. [2]

**2.5** State why potential is easier to add than the electric field. [2]