CIE Physics GCSE

Topic 4.2 - Electrical Quantities

Flashcards

Where are electric fields found?

Where are electric fields found?

Around every electric charge.

What is an electric field? (supplement)

What is an electric field? (supplement)

A region of space in which the effects of charge can be felt. When another charge enters the field, both charges interact and experience a force.

Objects with the same charge...

Objects with the same charge...

...repel.

Objects with opposite charges...

Objects with opposite charges...

...attract.

What is charging?

What is charging?

The addition or removal of electrons from a material.

How can charge be detected?

How can charge be detected?

Using a gold leaf electroscope; the gold leaf is repelled by positive charge or attracted to negative charge.

What is charging by induction?
(supplement)

What is charging by induction? (supplement)

When a charged object is brought near to a conductor, attracting/repelling electrons in the conductor and causing a net charge to develop in the conductor as a result of electron distribution.

What is a conductor?

What is a conductor?

A conductor is a material which **can** conduct electricity; electrons are able to flow through it.

What is an insulator?

What is an insulator?

An object which does not conduct electricity. Electrons cannot flow through the material.

How is static electricity produced?

How is static electricity produced?

When two insulators are rubbed together, transferring electrons, to form a positive and a negative charge.

What is an electric current?

What is an electric current?

Current is the rate of flow of charge in an electric circuit.

What is required in order for a charge/current to flow?

What is required in order for charge to flow?

- A potential difference
- A closed circuit

Describe the value of current across a circuit.

Describe the value of current across a circuit

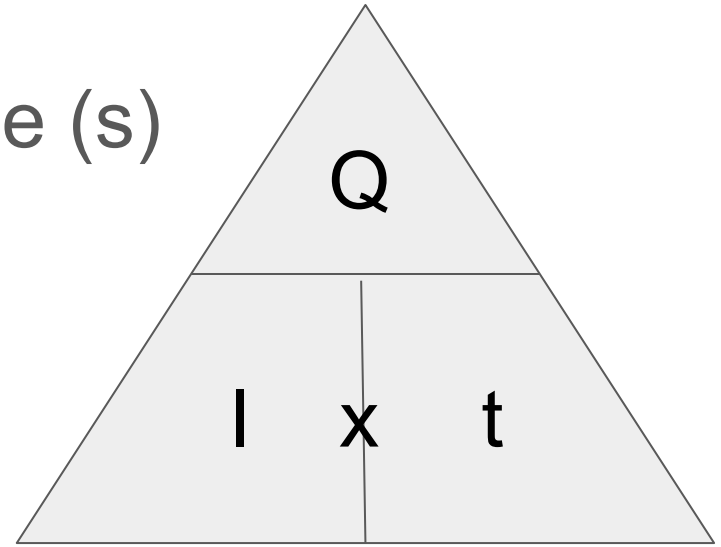
Current is the same at any point in a closed series circuit.

Current is split between the branches of a parallel circuit.

Give an equation linking charge and current, giving SI units (supplement)

Give an equation linking charge and current, giving SI units (supplement)

charge (C) = current (A) x time (s)



How is current measured?

How is current measured?

Using an ammeter, wired in series to the circuit.

What is conventional current?
(supplement)

What is conventional current? (supplement)

Conventional current (used in circuit diagrams etc.) represents the flow of positive charge; it flows in the opposite direction to the flow of electrons.

What is EMF?

What is EMF?

Electromotive force (the voltage supplied by a power source).

What are the units of EMF?

What are the units of EMF?

Volts, V.

Define EMF in terms of energy (supplement)

Define EMF in terms of energy (supplement)

The energy supplied by the source per unit charge around the circuit.

What are the units of potential difference?

What are the units of potential difference?

Volts, V.

Define potential difference (supplement)

Define potential difference (supplement)

The work done per unit charge flowing between any two points.

How is potential difference measured?

How is potential difference measured?

Using a voltmeter, wired in parallel.

What is 1V equivalent to? (supplement)

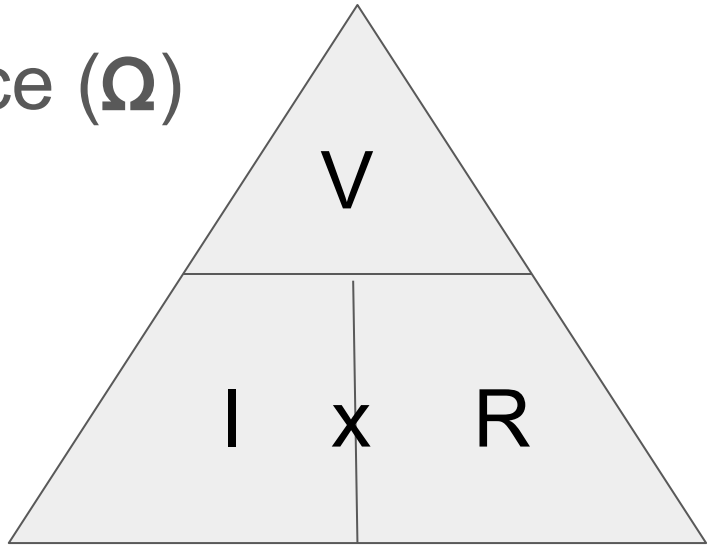
What is 1V equivalent to? (supplement)

1 Joule per Coulomb (1 JC^{-1})

Give an equation linking current and voltage, giving all SI units

Give an equation linking current and potential difference, giving all SI units

p.d. (V) = current (A) x resistance (Ω)



How does resistance affect the current flowing through a circuit?

How does resistance affect the current flowing through a circuit?

The larger the total resistance in the circuit, the smaller the current will be.

Describe an experiment to investigate the resistance of a wire.

Describe an experiment to investigate the resistance of a wire.

- Use a length of wire connected to an ammeter (in series), a voltmeter (in parallel) and a power supply
- Connect two crocodile clips to the wire, one at each end, and record the current and voltage
- Vary the length of the wire (moving one of the clips), recording V and I
- Plot a graph of V against I; the gradient = resistance of wire

Draw the IV characteristic of an ohmic conductor (at a constant temperature) (supplement)

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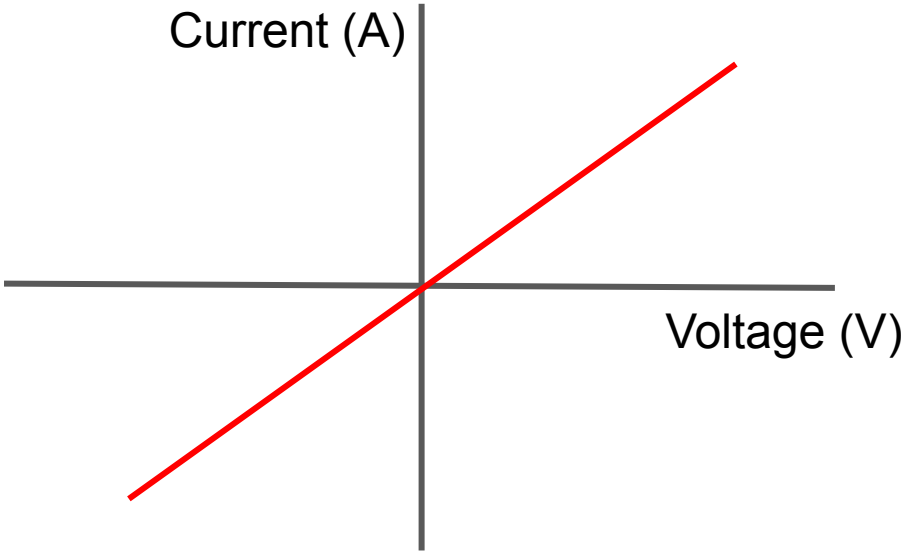

Draw and explain the IV characteristic of a filament lamp (supplement)

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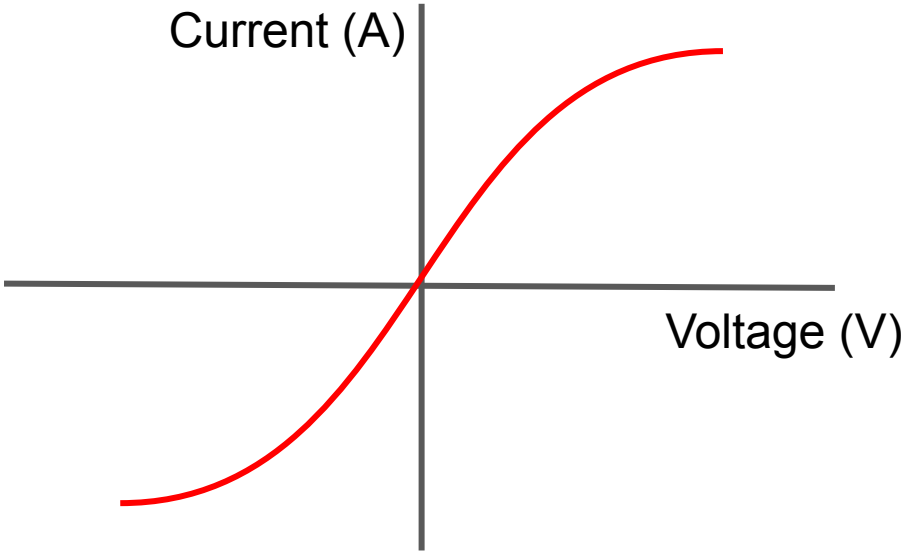

When current flows, the filament produces heat. This increases the resistance of the filament (R=V/I)

How does resistance relate to the length of a wire?

How does resistance relate to the length of a wire?

Resistance increases with length.

$R \propto L$

How does resistance relate to the cross sectional area of a wire?

How does resistance relate to the cross sectional area of a wire?

Resistance decreases as cross sectional area increases (they are inversely proportional).

$R \propto 1/A$

How is energy transferred in a circuit?

How is energy transferred in a circuit?

From the battery/power source to the circuit components, and dissipated into the surroundings as heat.

What factors affect the energy transferred when charge flows through a component?

What factors affect the energy transferred when charge flows through a component?

- Amount of charge
- The potential difference across the component

Give an equation linking power and potential difference, giving all SI units (supplement)

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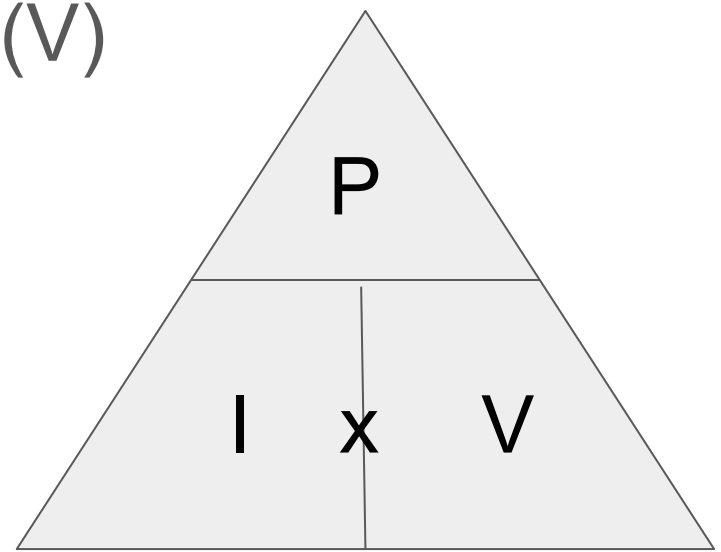
power (W) = current (A) x p.d. (V)



Give an equation linking power and energy, giving all SI units (supplement)

Give an equation linking power and energy, giving all SI units (supplement)

power (W) = energy (J) ÷ time (s)

This means that E = VIt