# Edexcel IGCSE Physics

## 2 - Electricity

Flashcards

# What three main components make up an atom?

What three main components make up an atom?

- Electrons
- Protons
- Neutrons

Describe the structure of an atom in terms of the position of its components.

Describe the structure of an atom in terms of the position of its components?

- Neutrons and protons in the nucleus
- Electrons surrounding the nucleus in shells

An atom contains two types of charged particles, name both of them and state their charges.

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- Proton (+1)
- Electron (-1)

# This symbol represents a cell. Which side is the positive terminal?

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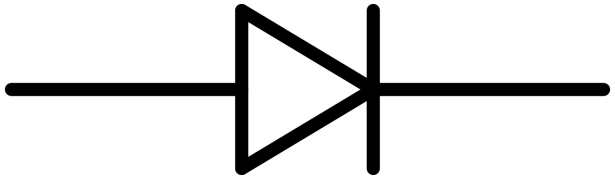
Left side (longer side)

# Which of these two symbols represents a resistor?

# Which of these two symbols represents a resistor?

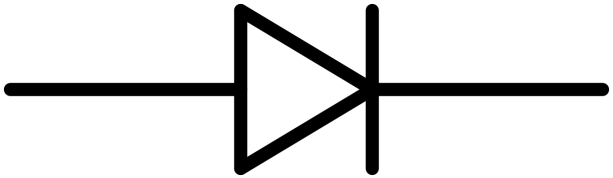
## Resistor

# What does this symbol represent?



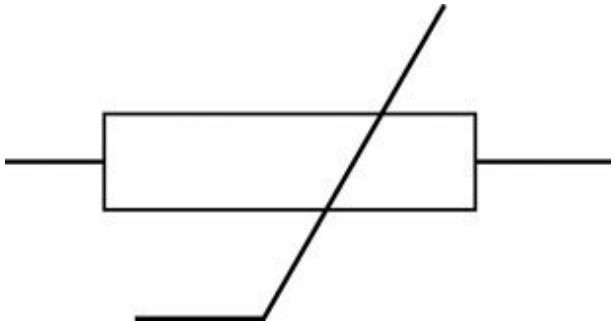
# What does this symbol represent?

Diode



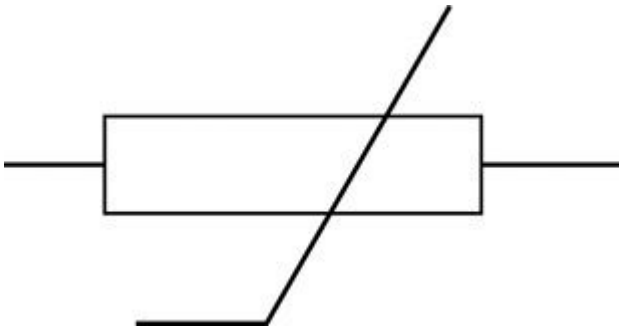
a) Which component does this symbol represent?

b) How is it affected by changes in temperature?

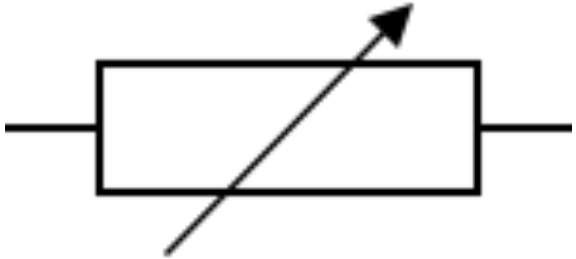


a) This symbol represents a thermistor.

b) As temperature increases, its resistance decreases

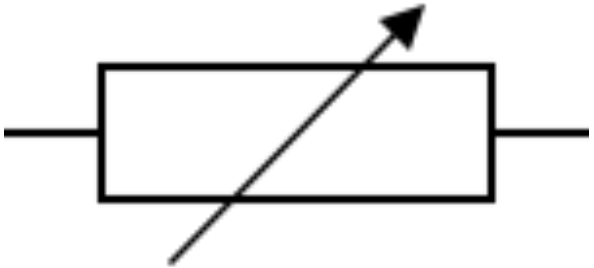


# What appliance does this symbol represent?



# What appliance does this symbol represent?

## Variable resistor



# What does this symbol represent?

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## LDR (Light Dependent Resistor)

# Voltage is also known as ….

Voltage is also known as ….

Potential difference

# What are the differences between series and parallel circuits in regards to current and voltage?

# What are the differences between series and parallel circuits in regards to current and voltage?

**Series (all components are connected in the same loop)**

- The same current flows through all the components
- The potential difference across the components is not the same. The total potential difference is equal to the sum of potential differences across each component.

**Parallel (the components are on different loops)**

- The current flowing in a junction is equal to the current leaving it. The sum of the currents in each section is equal to the total current.
- The potential difference across each branch is the same.

# Where must a voltmeter be placed in a circuit?

# Where must a voltmeter be placed in a circuit?

In parallel with the component that is being measured.

Give an equation relating potential difference with energy transferred and charge.

Give an equation relating potential difference with energy transferred and charge.

Voltage (V) = energy transferred (J) / charge (C)

V=E/Q

# A volt can also be described as ...

A volt can also be described as a ...

Joule per coulomb

# What is an electric current?

# What is an electric current?

The rate of flow of charge.

# What is an ammeter and where must it be connected in a circuit?

What is an ammeter and where must it be connected in a circuit?

An ammeter measures current. It is placed in series with the component it is required to measured.

# What equation including time and current can be used to measure charge?

What equation including time and current can be used to measure charge?

Charge (C) = Time (s) x Current (A)

Q = I x t

In a closed circuit, if there is a potential difference in the circuit there will also be a ...

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Current

# State an equation linking current, voltage and resistance with their units

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Voltage(V) = Current (A) x Resistance (Ω)

$V = I \times R$

# How does changing the resistance in a circuit change the current?

# How does changing the resistance in a circuit change the current?

- Current is inversely proportional to resistance. Therefore at a constant voltage, increasing the resistance will decrease the current.
- In an electrical circuit the flow of electrons causes a current. A high resistance makes it harder for electrons to pass through and therefore reduces the current.

How can you use a variable resistor to increase the current in a series circuit?

How can you use a variable resistor to increase the current in a series circuit?

You set the variable resistor to have a lower resistance, this should increase the current.

Explain why when two resistors are in series the overall resistance increases.

# Explain why when two resistors are in series the overall resistance increases.

When two resistors are in series

- The current in each of them is the same ie $I_1 = I_2 = I_T$
- The total voltage = the sum of the voltage across each resistor ie $V_T = V_1 + V_2$

Therefore as $V_1 = I_T \times R_1$ and $V_2 = I_T \times R_2$ then $V_T = (I_T \times R_1) + (I_T \times R_2)$, which can be written as $V_T = I_T(R_1 + R_2)$. Also $V_T = I_T \times R_T$.

**Therefore $R_T = R_1 + R_2$.**

**Therefore the overall resistance increases as you add resistors in series.**

# Why does the net resistance of two resistors in parallel decrease?

# Why does the net resistance of two resistors in parallel decrease?

In parallel:

- $I_T = I_1 + I_2 + I_3$
- $V_1 = V_2 = V_3$

**Therefore $1/R_T = 1/R_1 + 1/R_2 + 1/R_3$**

# Explain the relationship between voltage, current and resistance in a filament lamp.

# Explain the relationship between voltage, current and resistance in a filament lamp.

As temperature increases in the lamp, the resistance also increases. This is because a higher temperature makes the ions in the filament vibrate more, making it harder for electrons to pass through. This therefore decreases the current.

A filament lamp is not ohmic, meaning that current is not directly proportional to the potential difference. If voltage is double, current will not be doubled since there will be an increase in resistance

# How do diodes work?

# How do diodes work?

A diode only allows current to flow in one direction. If current is flowing the right way, the resistance very large at small voltages (up until about 0.6V), but then at higher voltages the resistance becomes very small.

Describe the relationship between thermistors and resistance.

Describe the relationship between thermistors and resistance.

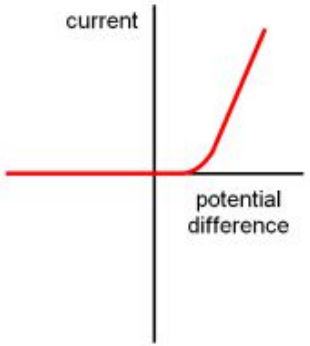
The resistance of a thermistor changes with temperature, therefore when the temperature increases the resistance decreases.

# How does a LDR work?

# How does a LDR work?

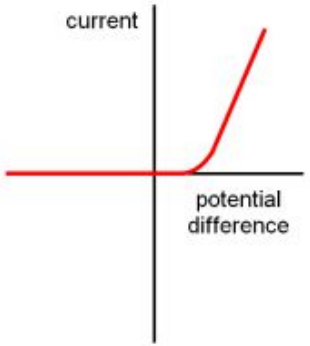
The resistance of a LDR varies with light. As the light intensity increases the resistance decreases and vice versa.

# What electrical component does this graph represent?



# What electrical component does this graph represent?

## Diode



When an electrical current flows through a resistor why does it heat up?

When an electrical current flows through a resistor why does it heat up?

There are collisions between the electrons and the ions in the resistor's lattice. This causes a transfer of kinetic energy into thermal energy, which is released into the surroundings.

# How do low resistance wires reduce unwanted energy transfers?

How do low resistance wires reduce unwanted energy transfers?

A smaller resistance will mean there are fewer collisions, therefore less energy will be wasted through heating.

# What are some advantages and disadvantages of the heating effect?

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Advantages

- Can be used for appliances such as toasters or electrical fires, where the hot wire helps heat the bread or room

Disadvantages

- The loss of energy as heat energy can make an appliance inefficient
- If an appliance overheats it can catch fire or overheat, which could ruin the device or injure the user

# State the equation linking electrical energy transferred, voltage, current and time

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E = I (current) x V (voltage) x T (time)

The energy transferred per second is also known as...

The energy transferred per second is also known as...

Power (in Watts)

# State an equation linking electrical power, current and voltage

# State an equation linking electrical power, current and voltage

Power = Current x Voltage

P = I x V

# State an equation for power in terms of current and resistance.

Give an equation for power in terms of current and resistance.

$P = I^2 \times R$ (Sub $V = IR$ into $P = IV$)

P (power /W) = $I^2$ (current$^2$ / A$^2$) x R (resistance / Ω)

# What is meant by direct current?

# What is meant by direct current?

Current flows only in one direction

# What is meant by an alternating current?

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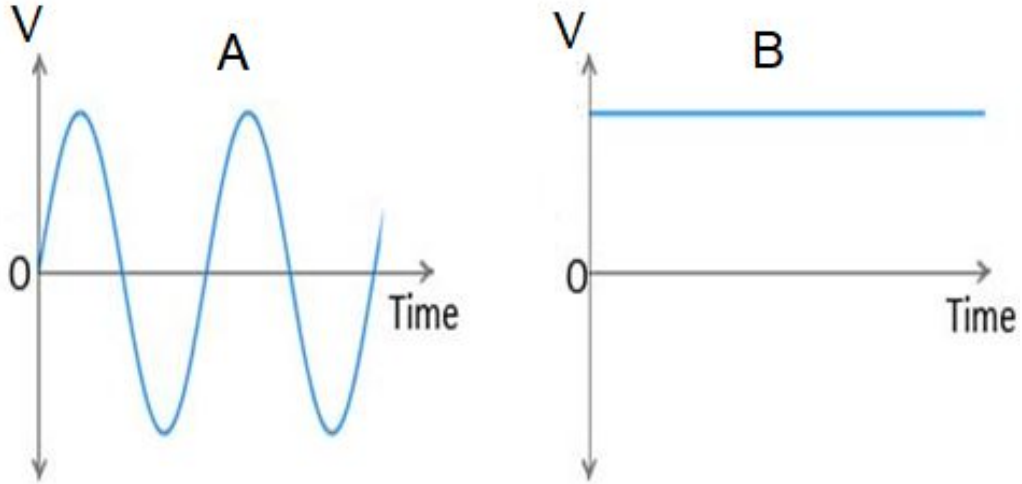
Direction of current changes continuously as time passes

Two voltage-time graphs are given below. Decide which one supplies D.C and which one supplied A.C



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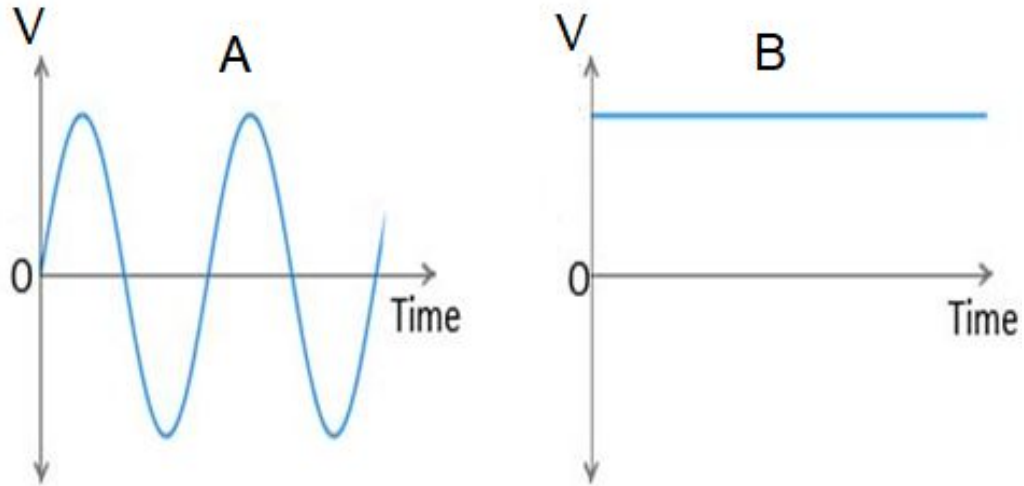


A = Alternating Current

B = Direct Current

# What type of current do batteries and cells supply?

What type of current do batteries and cells supply?

Direct current.

What is the difference between the function of the live and the neutral mains input wires?

# What is the difference between the function of the live and the neutral mains input wires?

Live wire supplies the voltage to the circuit and forms the current within the circuit. Therefore it is considered the dangerous wire.

The neutral wire is used to carry the current away from the appliance. It also completes the circuit so that current can flow.

# How does an earth wire ensure safety?

# How does an earth wire ensure safety?

The earth wire is connected to the metal casing of the device and provides a low resistance path to the ground. Therefore if a fault occurs the earth wire allows the large currents in the live wire to flow through to the ground.

# What colour is the live wire?

# What colour is the live wire?

Brown / Red

# What colour is the neutral wire?

# What colour is the neutral wire?

Blue.

# What colour is the earth wire?

What colour is the earth wire?

Green and yellow

# How does a fuse wire stop the device from getting damaged?

# How does a fuse wire stop the device from getting damaged?

When a fault occurs and there is an excess current flow, fuse melts(blows) and disconnects the live wire.

Current flow must be greater than fuse rating for fuse to blow.

# Why is it important to connect a fuse or switch to the live wire?

# Why is it important to connect a fuse or switch to the live wire?

When the switch is turned off, or when the fuse breaks, it will break the circuit and stop current running through the wire since live wire carries the voltage. This provides a method to stop current flowing into the appliance.

Some appliances are said to be double insulated. Explain what is meant by double insulation.

Some appliances are said to be double insulated. Explain what is meant by double insulation.

When casing of an appliance is made out of plastic, it is said to be double insulated since plastic is an insulator and does not let electricity pass through.

Which connection is not required when the appliance is double insulated?
Give a reason for your answer.

Which connection is not required when the appliance is double insulated? Give a reason for your answer.

Earth wire is not required.
Because earth wire is connected to the casing of the material. If casing is made out of plastic(insulator), earth wire will not be able to let the current flow to the ground.

Circuit breakers can be used instead of fuses. Give 2 advantages of circuit breakers over fuses

Circuit breakers can be used instead of fuses.
Give 2 advantages of circuit breakers over fuses

More sensitive

Easier to reset

Does not need to be replaced.