a

Draw the symbol diagrams for:

switch (open) **switch (closed)**

lamp **fuse**

diode **LED**

cell **battery**

voltmeter **ammeter**

resistor **variable resistor**

thermistor **LDR**

b

What is electric current?

_____

What is the equation that links charge flow, current and time?

_____

Write the symbols and units for the following.

charge flow: _____

current: _____

time: _____

c

What is the equation that links current, potential difference and resistance?

_____

Write the symbols and units for the following:

potential difference: _____

resistance: _____

If you were measuring resistance, what would you need to measure and what components would you need?

_____

_____

d

Draw a circuit diagram including the following components:
ammeter, voltmeter, battery, lamp, variable resistor.

e

Resistors
Draw the current-potential difference graphs for:
resistor

filament lamp

diode

f

Look at the graphs you drew in box e. Which graphs show a linear relationship and which show a non-linear relationship?

_____

_____

g

Thermistor: as temperature increases, resistance _____

Uses:

_____

LDR: as intensity increases, resistance _____

Uses:

_____

h

Complete the table:

Type of Circuit	Potential Difference: Shared or the Same?	Current: Same or Split between Branches?

i

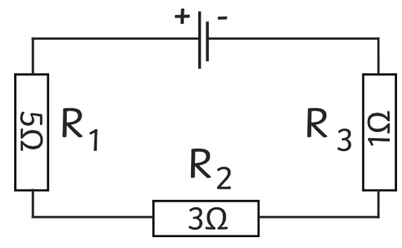
What is the effect on the total resistance of adding resistors into a:

a. series circuit? _____

b. parallel circuit? _____

j

For the below circuit, calculate the total resistance.



Total resistance =

k

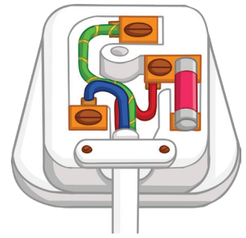
In the UK, mains electricity has an ac supply. Explain the difference between ac and dc.

_____

_____

_____

Label the diagram of the 3-point plug:



l

What is the purpose of the three core cables in electrical appliances?

live wire: _____

_____

neutral wire: _____

_____

earth wire: _____

_____

How would you make sure that the live wire to a switch is dead?

_____

_____

_____

Explain why it is dangerous to have any connection between the live wire and the Earth.

_____

_____

_____

a

What is the equation linking power, potential difference and current?

_____

What is the equation linking power, current and resistance?

_____

Write the symbol and unit for power.

_____

b

Describe how each of the appliances below transfers energy.

Kettle

_____

_____

_____

Hairdryer

_____

_____

_____

c

What is the equation linking energy transferred, power and time?

_____

What is the equation linking energy transferred, charge flow and potential difference?

_____

Write the symbol and unit for energy transferred.

_____

d

Describe the relationship between the power ratings of appliances and the changes in stored energy when they are in use.

_____

_____

_____

_____

_____

_____

e

Why is energy transferred at such a high voltage in cables?

_____

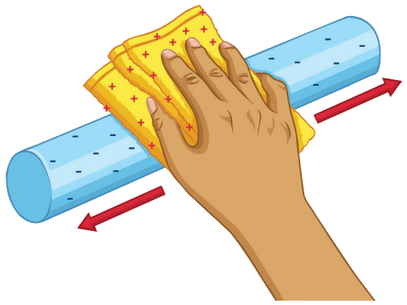
_____

Describe how the following work:

a. step-up transformer: _____

b. step-down transformer: _____

f



Describe what happens to these insulating materials (above) when they are rubbed together.

_____

_____

_____

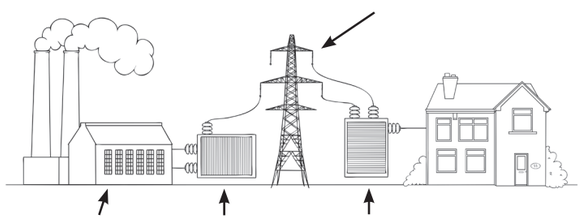
What happens when two objects are brought together that have:

a. the same charge? _____

b. the opposite charge? _____

g

Label the National Grid diagram.



h

Complete the diagrams below to show the electric fields around positively and negatively charged spheres.

i

Charged objects have an electric field around them.

Where is this field the strongest?

_____

What happens to the field strength as you go further away from the charged object?

_____

Charged objects exert a force on one another when they are brought close together.

What is this type of force called?

_____

Where is the force the greatest?

_____

j

List some everyday examples of static electricity:

1. _____

2. _____

3. _____

k

My main areas for improvement in this topic are:

_____

_____

_____

_____

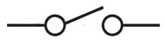
_____

_____

a

Draw the symbol diagrams for:

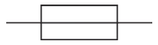
switch (open)



switch (closed)

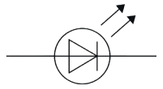
lamp

fuse



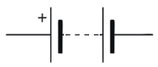
diode

LED



cell

battery



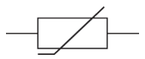
voltmeter

ammeter

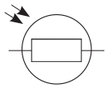
resistor

variable resistor

thermistor



LDR



b

What is electric current?

Electric current is the flow of charge.

What is the equation that links charge flow, current and time?

charge flow = current × time

Write the symbols and units for the following.

charge flow: **(Q) – coulombs, C**

current: **(I) – amperes, A**

time: **(t) – seconds, s**

c

What is the equation that links current, potential difference and resistance?

Potential difference = current × resistance

Write the symbols and units for the following:

potential difference: **(V) – volts, V**

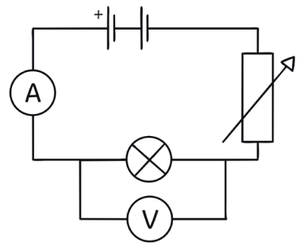
resistance: **(R) – ohms, Ω**

If you were measuring resistance, what would you need to measure and what components would you need?

Current and potential difference using an ammeter and voltmeter respectively.

d

Draw a circuit diagram including the following components:
ammeter, voltmeter, battery, lamp, variable resistor.

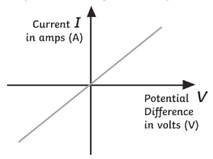


e

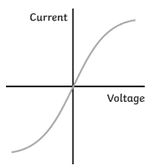
Resistors

Draw the current-potential difference graphs for:

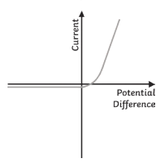
resistor



filament lamp



diode



f

Look at the graphs you drew in box e. Which graphs show a linear relationship and which show a non-linear relationship?

The ohmic conductor shows a linear relationship.

The filament lamp and diode both show non-linear relationships.

g

Thermistor: as temperature increases, resistance **decreases**

Uses:

temperature detectors in car engines or thermostats

LDR: as intensity increases, resistance **decreases**

Uses:

street lights

h

Complete the table:

Type of Circuit	Potential Difference: Shared or the Same?	Current: Same or Split between Branches?
series	**shared**	**same**
parallel	**same**	**split between brances**

i

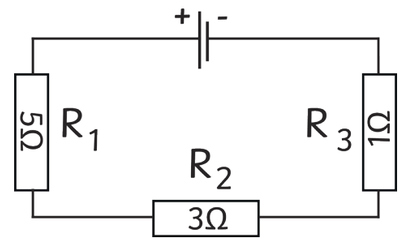
What is the effect on the total resistance of adding resistors into a:

a. series circuit? **Increase in the total resistance.**

b. parallel circuit? **Decrease in the total resistance.**

j

For the below circuit, calculate the total resistance.



Total resistance = **9 Ω**

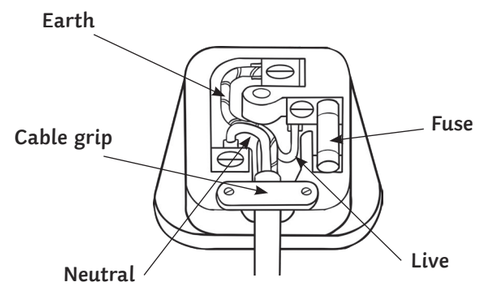
k

In the UK, mains electricity has an ac supply. Explain the difference between ac and dc.

In direct current, the electrons flow in one direction only.

In alternating current, the flow of electrons changes.

Label the diagram of the 3-point plug:



l

What is the purpose of the three core cables in electrical appliances?

live wire: **the alternating current from the mains supply flows through this.**

neutral wire: **this completes the circuit.**

earth wire: **this usually does not have a current running through it. It is a safety feature to prevent the appliance becoming live.**

How would you make sure that the live wire to a switch is dead?

Switch off the supply from the main circuit board or remove the fuse from the main circuit board and test that it's dead.

Explain why it is dangerous to have any connection between the live wire and the Earth.

This is a short circuit which will cause a high current to flow and could cause a fire. If the fuse did not blow then a person touching it could also get electrocuted.

a

What is the equation linking power, potential difference and current?

power = potential difference × current

What is the equation linking power, current and resistance?

power = (current)^2 × resistance

Write the symbol and unit for power.

Power (P) – watts, W

b

Describe how each of the appliances below transfers energy.

Kettle

Energy is transferred electrically from chemical energy stores in the power station to the internal (thermal) energy store of the heating element of the kettle.

Hairdryer

Energy is transferred electrically from chemical energy stores in the power station to the kinetic energy store of the motor and the internal (thermal) energy store of the heating element of the hairdryer.

c

What is the equation linking energy transferred, power and time?

energy transferred = power × time

What is the equation linking energy transferred, charge flow and potential difference?

energy transferred = charge flow × potential difference

Write the symbol and unit for energy transferred.

energy transferred (E) – joules, J

d

Describe the relationship between the power ratings of appliances and the changes in stored energy when they are in use.

An appliance with a higher power rating will transfer stored energy to other types of energy at a faster rate than one with a lower power rating.

e

Why is energy transferred at such a high voltage in cables?

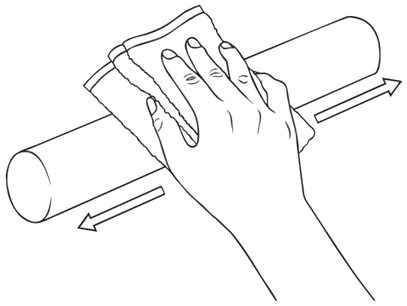
High voltages mean that the energy is transferred at low currents. This results in less resistance and therefore less energy is lost as heat.

Describe how the following work:

a. step-up transformer: **voltage is increased.**

b. step-down transformer: **voltage is decreased.**

f



Describe what happens to these insulating materials (above) when they are rubbed together.

When the cloth and acetate are rubbed together, friction causes electrons to be transferred from the cloth to the acetate. The acetate gains electrons so becomes negatively charged. The cloth loses electrons so becomes positively charged.

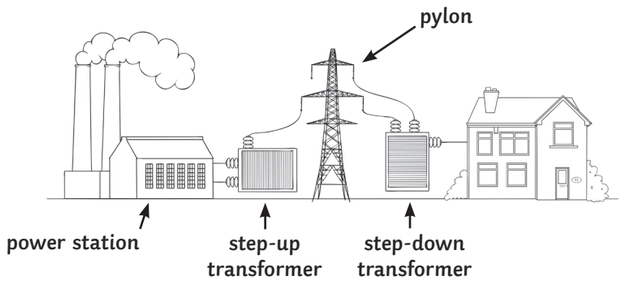
What happens when two objects are brought together that have:

a. the same charge? **They repel.**

b. the opposite charge? **They attract.**

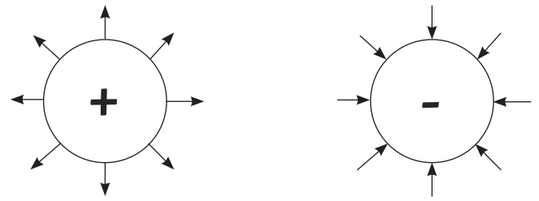
g

Label the National Grid diagram.



h

Complete the diagrams below to show the electric fields around positively and negatively charged spheres.



i

Charged objects have an electric field around them.

Where is this field the strongest?

The field is strongest closer to the charged object.

What happens to the field strength as you go further away from the charged object?

As you go further away from the object, the field strength decreases.

Charged objects exert a force on one another when they are brought close together.

What is this type of force called?

Non-contact force.

Where is the force the greatest?

The force is greatest closer to the object.

j

List some everyday examples of static electricity:

1. **Giving someone an electric shock after sliding down the stairs.**
2. **Getting an electric shock from taking a jumper off.**
3. **A balloon causing hair to stand on end when it has been rubbed against a jumper.**

(This is not an exhaustive list. Students may come up with many more.)